RULES

PUBLICATION 58/P

HULL SURVEYS OF DOUBLE HULL OIL TANKERS

July
2024

Publications P (Additional Rule Requirements) issued by Polski Rejestr Statków complete or extend the Rules and are mandatory where applicable.

GDAŃSK

Publication 58/P – Hull Surveys of Double Hull Oil Tankers – July 2024 based on the IACS Unified Requirements (UR) Z10.4 is an extension of the requirements contained in Part I – *Classification Regulations* of the *Rules for the Classification and Construction of Sea-going Ships.*

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PRS/RP, 06/2024

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1 GENERAL

1.1 Application

1.1.1 The requirements apply to all self-propelled double hull oil tankers.

1.1.2 The requirements apply to surveys of hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks.

These requirements are additional to the classification requirements applicable to the remainder of the ships.

1.1.3 The requirements contain the minimum extent of examination, thickness measurements and tank testing. The survey shall be extended when substantial corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.2 Definitions and Explanations

Ballast tank – a tank which is used primarly for the carriage of water ballast.

Double Hull Oil Tanker - is a ship which is constructed primarily for the carriage of oil in bulk, has the cargo tanks forming an integral part of the ship's hull and is protected by a double hull which extends for the entire length of the cargo area, consisting of double sides and double bottom spaces for the carriage of water ballast or void spaces.

Cargo area – that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length of the part of the ship over the above mentioned spaces.

Close-up Survey – a survey where the details of structural components are within the close visual inspection range of the Surveyor, i.e. normally within reach of hand.

Coating condition – coating condition is defined as follows:

GOOD – condition with only minor spot rusting,

FAIR – condition with local breakdown at edges of stiffeners and weld connections and/or rusting over 20% or more of areas under consideration, but less than as defined for poor condition,

POOR – condition with general breakdown of coating over 20% or more, or hard scale at 10% or more, of areas under consideration.

Combined cargo/ballast tank – is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a ballast tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL I/18(3) shall be considered as cargo tanks.

Corrosion prevention system – normally considered a full hard protective coating. Hard protective coating shall usually be epoxy coating or equivalent. Other coating systems may be considered acceptable as alternatives, provided that they are applied and maintained in compliance with the manufacturer's specification.

Critical structural area – locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

Double hull oil tanker – a ship which is constructed primarily to carry oil in bulk, which have the cargo tanks protected by a double hull which extends for the entire length of the cargo area, consisting of double sides and double bottom spaces for the carriage of water ballast or void spaces.

CSR – IACS Common Structural Rules; *Publication 85/P – Requirements Concerning the Construction and Strength of the Hull and Hull Equipment of Sea-going, Double Hull Oil Tankers of 150 m in Length and above*.

Overall Survey – a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

Prompt and thorough repair – permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the issuance of any condition of class.

Renewal thickness – (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members shall be performed.

Representative tanks – those tanks which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks, account shall be taken of the service and repair history onboard and identifiable critical structural areas and/or suspect areas.

Special consideration or specially considered (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements shall be taken to confirm the actual average condition of the structure under the coating.

Substantial corrosion – an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of the 75% of allowable margins, but within the acceptable limits. For ships built under the CSR, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates thickness between t_{ren} + 0.5 mm and t_{ren}.

Suspect areas – locations showing substantial corrosion and/or considered by the Surveyor to be prone to rapid wastage.

Transverse section – includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, inner bottom and longitudinal bulkheads. For transversely framed ships, a transverse section includes adjacent frames and their end connections in way of transverse sections.

Pitting corrosion – is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in Fig. 1.

Edge corrosion – is defined as local corrosion at the free edges of plates, stiffeners, primary support members and around openings. An example of edge corrosion is shown in Fig. 2.

Grooving corrosion – is typically local material loss adjacent to weld joints along abutting stiffeners and at stiffener of plate butts or seams. An example of groove corrosion is shown in Fig. 3.

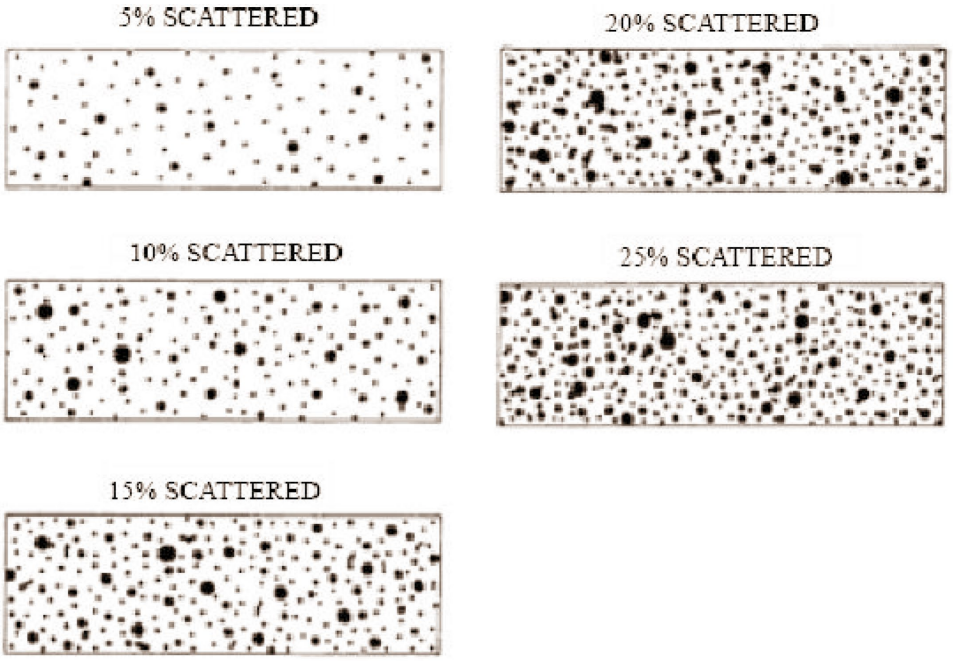


Fig. 1. Pitting intensity diagrams

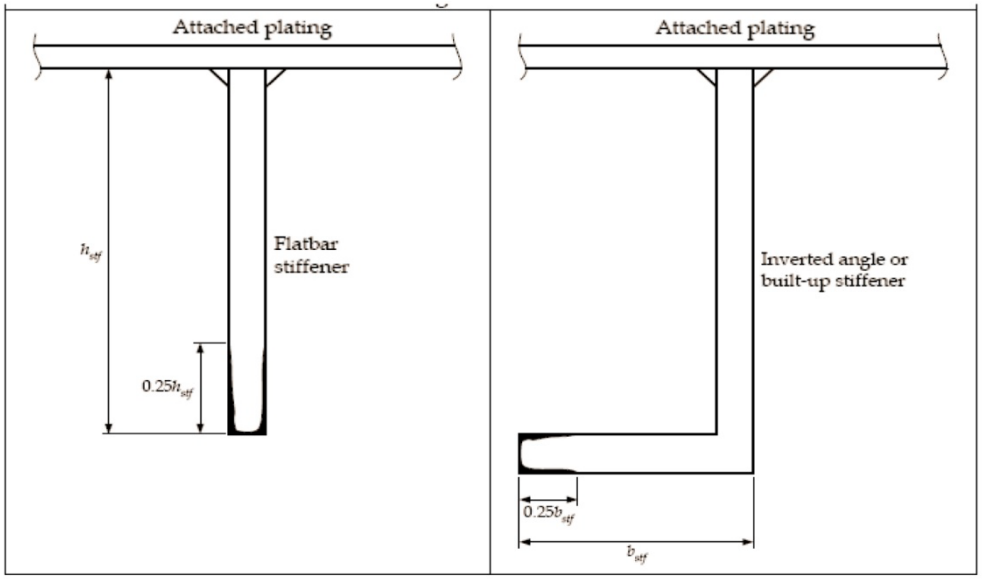


Fig. 2. Edge corrosion

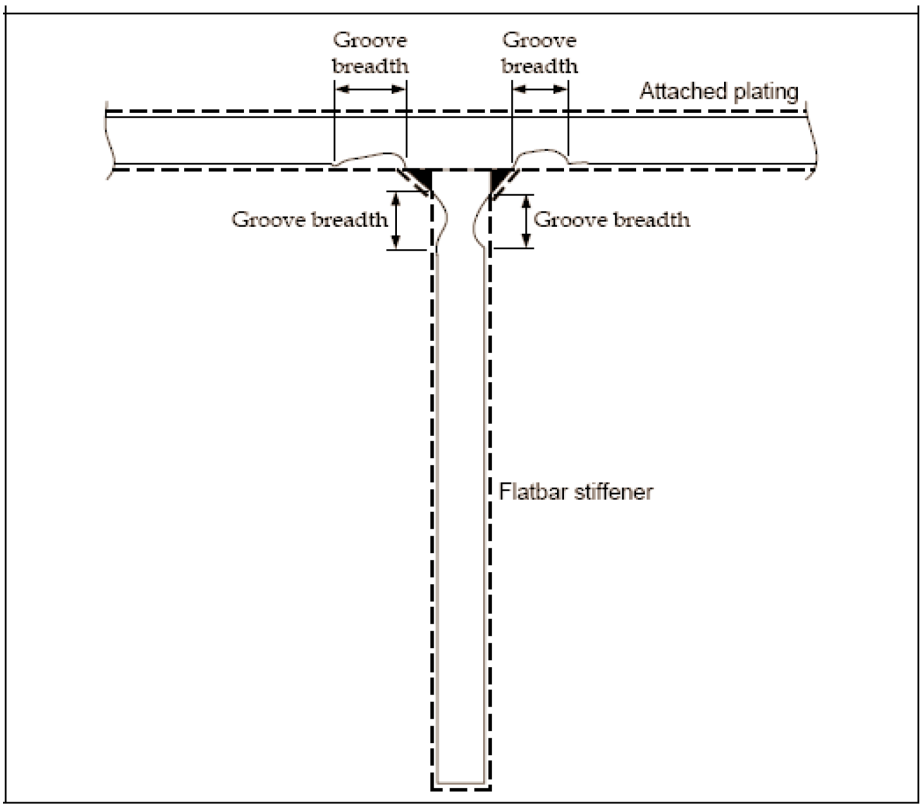


Fig. 3. Grooving corrosion

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits which affects or, in the opinion of the Surveyor, will affect the ship's structural, watertight or weathertight integrity, shall be promptly and thoroughly repaired. Areas to be considered include:

- bottom structure and bottom plating;
- inner bottom structure and inner bottom plating;
- side structure and side plating;
- inner side structure and inner side plating;
- deck structure and deck plating;
- watertight or oiltight bulkheads,
- hatch covers or hatch coamings, where fitted (combination carriers).

For locations where adequate repair facilities are not available, consideration may be given to allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of structural defects or corrosion, either of which, in the opinion of the Surveyor, will impair the vessel's fitness for continued service, remedial measures shall be implemented before the ship continues service.

1.3.3 Where the damage found on structure mentioned in 1.3.1 is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity and issue a codition of class with a specific time limit.

1.4 Thickness Measurements and Close-up Surveys

In any kind of survey, i.e. Class Renewal, Intermediate, Annual or other Surveys having the scope of the foregoing ones, thickness measurements when required in Table II, of structures in areas where close-up surveys are required, shall be performed simultaneously with Close-up Surveys.

2 ANNUAL SURVEY

2.1 Schedule

Annual Surveys shall be held within 3 months before or after anniversary date from the date of the initial classification survey or of the date credited for the last Class Renewal Survey.

2.2 Scope

2.2.1 General

2.2.1.1 The survey shall consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

2.2.1.2 For oil tankers built under IACS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out.

2.2.2 Examination of the Hull

2.2.2.1 Examination of the hull plating and its closing appliances as far as can be seen.

2.2.2.2 Examination of watertight penetrations as far as practicable.

2.2.3 Examination of Weather Deck

2.2.3.1 Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

2.2.3.2 Examination of cargo tanks pressure/vacuum valves and flame screens.

2.2.3.3 Examination of flame screens on vents to all bunker tanks.

2.2.3.4 Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.

2.2.3.5 Examination of all pump room bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room bulkheads.

2.2.3.6 Examination of the condition of all piping systems.

2.2.4 Examination of Ballast Tanks

2.2.4.1 Examination of ballast tanks where required as a consequence of the results of the Class Renewal Survey (see 4.2.3) and Intermediate Survey (see 3.2.2.1 and 3.2.2.2) shall be performed.

When considered necessary by the Surveyor, or when extensive corrosion exists, thickness measurements shall be performed and if the result of these measurements indicates that substantial corrosion is found, the extent of thickness measurement shall be increased in accordance with Table

IV. These extended thickness measurements shall be performed before the survey is credited as completed. Suspect areas identified at previous surveys shall be examined. Areas of substantial corrosion identified at previous surveys shall have thickness measurements taken.

3 INTERMEDIATE SURVEY

3.1 Schedule

3.1.1 The Intermediate Survey shall be held either at the 2nd or 3rd Annual Survey or between those surveys.

3.1.2 Those items, which are additional to the requirements of the Annual Survey, may be surveyed either at or between the 2nd and 3rd Annual Survey.

3.1.3 Surveys and thickness measurements of spaces, once credited towards Class Renewal Survey can not be credited towards Intermediate Survey.

3.2 Scope

3.2.1 General

3.2.1.1 The survey extent is dependent on the age of the vessel as specified in 3.2.2 to 3.2.4 and shown in Table V.

3.2.1.2 For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems, as well as vent masts and headers shall be performed. If, upon examination, there is any doubt as to he condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

3.2.1.3 For ships built under CSR, the identified substantial corrosion areas are required to be examined and additional thickness measurements shall be performed.

3.2.2 Double Hull Oil Tankers between 5 and 10 Years of Age

3.2.2.1 For tanks used for salt-water ballast, an overall survey of representative tanks selected by the Surveyor, shall be performed.

If such inspections reveal no visible structural defects, the examination may be limited to a verification that the hard protective coating remains in GOOD condition.

3.2.2.2 A ballast tank shall be examined at subsequent annual intervals where:
- a hard protective coating has not been applied from the time of construction, or
- a soft or semi-hard coating has been applied, or
- substantial corrosion is found within the tank, or
- the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

3.2.2.3 In addition to the requirements above, suspect areas identified at previous surveys shall be examined.

3.2.3 Double Hull Oil Tankers between 10 and 15 Years of Age

3.2.3.1 The requirements of the Intermediate Survey shall be to the same extent as the previous Class Renewal Survey as required in 4. and 5.1. However, pressure testing of cargo and ballast tanks and checking compliance the requirements of longitudinal strength evaluation of hull girder as required in 8.1.1.1 are not required unless deemed necessary by the attending Surveyor.

3.2.3.2 In application of 3.2.3.1, the Intermediate Survey may be commenced at the second Annual Survey and be progressed during the succeeding year with a view to completion at the third Annual Survey.

3.2.3.3 An underwater survey may be considered in lieu of the requirements of 4.2.2.

3.2.4 Double Hull Oil Tankers over 15 Years of Age

3.2.4.1 The requirements of Intermediate Survey shall be to the same extent as the previous Class Renewal Survey as required in 4 and 5.1. However, pressure testing of cargo and ballast tanks and checking compliance with the requirements for longitudinal strength evaluation of hull girder as required in 8.1.1.1 are not required unless deemed necessary by the attending Surveyor.

3.2.4.2 In application of 3.2.4.1, the Intermediate Survey may be commenced at the second Annual Survey and be progressed during the succeeding year with a view to completion at the third Annual Survey.

3.2.4.3 In application of 3.2.4.1, a survey in dry dock shall be a part of the Intermediate Survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks shall be performed in accordance with the applicable requirements for Intermediate Surveys, if not already performed. Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

4 CLASS RENEWAL SURVEY

4.1 Schedule

4.1.1 Class Renewal Surveys shall be performed at 5 yearly intervals.

4.1.2 The first Class Renewal Survey shall be completed within 5 years from the date of the initial classification survey and thereafter within 5 years from the credited date of the previous Class Renewal Survey.

However, an extension of class of 3 months maximum beyond the 5th year can be granted in exceptional circumstances. In this case, the next period of class will start from the expiry date of the Class Renewal Survey before extension was granted.

4.1.3 For surveys completed within 3 months before expiry date of the Class Renewal Survey, the next period of class will start from the expiry date of the Class Renewal Survey.

For surveys completed more than 3 months before the expiry date of the Class Renewal Survey, the period of class will start from the survey completion date.

In cases where the ship has been laid up or has been out of service for a considerable period because of a major repair or modification and the Owner elects to only perform the overdue surveys, the next period of class will start class renewal survey. If the Owner elects to perform the next due class renewal survey, the period of class will start from the survey completion date.

4.1.4 The Class Renewal Survey may be commenced at the 4th Annual Survey and be progressed with a view to completion by the 5th anniversary date. When the class renewal survey is commenced prior to the 4th annual survey, the entire survey shall be completed within 15 months if such work shall be credited to the class renewal survey.

4.1.5 Surveys and thickness measurements of spaces, once credited towards Intermediate Survey cannot be credited towards Class Renewal Survey.

4.2 Scope

4.2.1 General

4.2.1.1 The Class Renewal Survey shall include, in addition to the requirements of the Annual Survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 4.2.1.3, are in a satisfactory condition and are fit for its intended purpose for the new period of class of 5 years to be assigned, subject to proper maintenance and operation and to periodical surveys being performed at the due dates.

4.2.1.2 All cargo tanks, ballast tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull shall be examined, and this examination shall be supplemented by thickness measurement and testing as necessary required in 4.4 and 4.5, to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration that may be present.

4.2.1.3 Cargo piping on deck, including Cargo Oil Washing (COW) piping, cargo and ballast piping within the above tanks and spaces shall be examined and operationally tested under working pressure to the satisfaction of attending Surveyor to ensure that tightness and condition remain satisfactory. Special attention shall be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces, and Surveyor shall be advised on all occasions when this piping, including valves and fittings are open during repair periods and can be examined internally.

4.2.2 Dry-dock Survey

4.2.2.1 A survey in dry-dock shall be a part of the Class Renewal Survey. The overall and Close-up Surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks shall be performed n accordance with the applicable requirements for Class Renewal Surveys, if not already performed. Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

4.2.3 Tank Protection

4.2.3.1 Where provided, the condition of the corrosion prevention system of cargo tanks shall be examined. A ballast tank shall be examined at subsequent annual intervals where:
- a hard protective coating has not been applied from the time of construction, or
- a soft coating has been applied, or
- substantial corrosion is found within the tank, or
- the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

Thickness measurements shall be performed as deemed necessary by the Surveyor.

4.3 Extent of Overall and Close-up Survey

4.3.1 An overall survey of all tanks and spaces, shall be performed at each Class Renewal Survey.

4.3.2 The minimum requirements for Close-up Surveys at Class Renewal Survey are given in Table I.

4.3.3 The Surveyor may extend the Close-up Survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

a) in particular, for tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information;
b) for tanks which have structures approved with reduced scantlings due to approved corrosion control system.

4.3.4 For areas in tanks where hard protective coatings are found to be in GOOD condition, the extent of Close-up Surveys according to Table I may be specially considered.

4.4 Extent of Thickness Measurement

4.4.1 The minimum requirements for thickness measurements at Class Renewal Survey are given in Table II.

4.4.2 Provisions for extended measurements for areas with substantial corrosion are given in Table IV, and may be additionally specified in Survey Programme as required by 5.1. These extended thickness measurements shall be performed before the survey is credited as completed. Suspect areas identified at previous surveys shall be examined. Areas of substantial corrosion identified at previous surveys shall have thickness measurements taken.

For ships built under CSR, the identified substantial corrosion areas are required to be examined and additional thickness measurements shall be performed at annual and intermediate surveys.

4.4.3 The Surveyor may further extend the thickness measurement as deemed necessary.

4.4.4 For areas in tanks where hard protective coatings are found to be in GOOD condition, the extent of thickness measurements according to Table II may be specially considered.

4.4.5 Transverse sections for thickness measurements shall be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

4.4.6 In cases where two or three sections shall be measured, at least one shall include a ballast tank within 0.5*L* amidships. In case of oil tankers of 130 m in length and upwards (as defined in the *International Convention on Load Lines* in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength, as required in 9.1.1.1, the sampling method of thickness measurements is given in Annex III, Appendix 3.

For ships built under CSR, the identified substantial corrosion areas are required to be examined and additional thickness measurements shall be performed.

4.5 Extent of Tank Testing

4.5.1 The minimum requirements for ballast tank testing at Class Renewal Survey are given in 4.5.3 and Table III.

The minimum requirements for cargo tank testing at Class Renewal Survey are given in 4.5.4 and Table III.

Cargo tank testing performed by the vessel's crew under the direction of the Master may be accepted by the surveyor provided the following conditions are complied with:

a) a tank testing procedure, specifying fill heights, tanks being filled and bulkheads being tested, has been submitted by the owner and reviewed by the Society prior to the testing being carried out;
b) the tank testing is carried out prior to overall survey or close-up survey;

c) the tank testing is carried out within the special survey window and not more than three months prior to the date on which the overall or close up survey is completed;
d) the tank testing has been satisfactorily carried out and there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;
e) the satisfactory results of the testing is recorded in the vessel's logbook; and

Maximum water level f) the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey.

4.5.2 The Surveyor may extend the tank testing as deemed necessary.

4.5.3 Boundaries of ballast tanks shall be tested with a head of liquid to the top of air pipes.

4.5.4 Boundaries of cargo tanks shall be tested to the highest point that liquid will rise under service conditions.

4.5.5 The testing of double bottom tanks and other spaces not designated for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is performed.

5 PREPARATIONS FOR SURVEY

5.1 Survey Programme

5.1.1 The Owner in co-operation with PRS shall work out a specific *Hull Survey Programme* prior to the commencement of any part of:
– the Class Renewal Survey
– the Intermediate Survey for oil tanker over 10 years of age.

The *Hull Survey Programme* shall be in a written format based on the information in Annex IVA.

The survey shall not commence until the *Hull Survey Programme* has been agreed.

The *Hull Survey Programme* at Intermediate Survey may consist of the *Hull Survey Programme* at the previous Class Renewal Survey supplemented by the *Executive Hull Summary* of that Class Renewal Survey and later relevant survey reports.

The *Hull Survey Programme* shall be worked out taking into account any amendments to the survey requirements implemented after the last Class Renewal Survey performed.

Prior to development of the *Hull Survey Programme*, the *Survey Planning Questionnaire* shall be completed by the Owner based on the information set out in Annex IVB, and forwarded to PRS.

5.1.2 In developing the *Hull Survey Programme*, the following documentation shall be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:
.1 survey status and basic ship information;
.2 documentation on board, as described in 6.2 and 6.3;
.3 main structural plans of cargo and ballast tanks (scantling drawings); including information regarding use of high-tensile steels (HTS);
.4 *Executive Hull Summary*;
.5 relevant previous damage and repair history;
.6 relevant previous survey and inspection reports from both PRS and the Owner;
.7 cargo and ballast history for the last 3 years, including carriage of cargo under heated conditions;
.8 details of the inert gas plant and tank cleaning procedures;

.9 information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
.10 description and history of the coating and corrosion protection system (previous class notations), if any;
.11 inspections by the Owner's personnel during the last 3 years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system if any. Guidance for reporting is shown in Annex IVC;
.12 information regarding the relevant maintenance level during operation, including port state control reports of inspection containing hull related deficiencies, Safety Management System non-conformities relating to hull maintenance, including the associated corrective action(s);
.13 any other information that will help identify suspect areas and critical structural areas.

5.1.3 The submitted *Hull Survey Programme* shall account for and fulfil, as a minimum, the requirements of Tables I, II and 4.5 for Close-up Survey, thickness measurement and tank testing, respectively, and shall include relevant information including at least:
.1 basic ship information and particulars;
.2 main structural plans (scantling drawings), including information regarding use of high tensile steels (HTS);
.3 plan of tanks;
.4 list of tanks with information on their use, corrosion prevention and condition of coating;
.5 conditions for survey (e.g. information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
.6 provisions and methods for access to structures;
.7 equipment for surveys;
.8 nomination of tanks and areas for close-up survey (see 4.3);
.9 nomination of sections and areas for thickness measurement (see 4.4);
.10 nomination of tanks for tightness testing (see 4.5);
.11 identification of the thickness measurement firm;
.12 damage experience related to the ship in question;
.13 critical structural areas and suspect areas, where relevant.

5.1.4 PRS will advise the Owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of *Guidelines for Technical Assessment in Conjunction with Planning for Enhanced Surveys of Double Hull Oil Tankers*, contained in Annex I.

These guidelines are a recommended tool which may be invoked at the discretion of PRS, when considered necessary and appropriate, in conjunction with the preparation of the required *Survey Programme*.

5.2 Conditions for Survey

5.2.1 The Owner shall provide the necessary facilities for a safe execution of the survey, and:
.1 in order to enable the attending Surveyors to perform the survey, provisions for proper and safe access shall be agreed between the Owner and the PRS in accordance with PRS Instruction to Surveyors, Part I-1, Para 2.3.
.2 details of the means of access shall be provided in the *Survey Planning Questionnaire*,
.3 in cases where the provisions of safety and required access are judged by the attending surveyor(s) not to be adequate, the survey of the spaces involved shall not proceed.

5.2.2 Tanks and spaces shall be safe for access. Tanks and spaces shall be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it shall be verified that the atmosphere in that space is free from hazardous gas and contains sufficient oxygen. Requirements of *Publication 123/P –Safe entry to confined spaces* must be fulfilled.

5.2.3 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues etc. to reveal corrosion, deformation, fractures, damages, or other structural deterioration, as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the Owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.2.4 Significant illumination shall be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration.

5.2.5 Where soft coating have been applied, safe access shall be provided for the Surveyor to verify the effectiveness of the coating and to perform assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft coating shall be removed.

5.3 Access to Structures

5.3.1 For Overall survey, means shall be provided to enable the Surveyor to examine the tank structure in a safe and practical way.

5.3.2 For Close-up Survey, one or more of the following means for access, acceptable to the Surveyor, shall be provided:
- permanent staging and passages through structures,
- temporary staging and passages through structures,
- hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms,
- boats or rafts,
- portable ladders,
- other equivalent means.

5.4 Equipment for Survey

5.4.1 Thickness measurement is normally to be performed by means of ultrasonic test equipment.

The accuracy of the equipment shall be proven to the Surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the Surveyor:
- radiographic equipment,
- ultrasonic equipment,
- magnetic particle equipment,
- dye penetrant.

5.4.3 Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use shall be made available during the survey. A safety check-list should be provided.

5.4.4 Adequate and safe lighting shall be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing shall be made available and used during the survey (e.g. safety helmets, gloves, safety shoes, etc.).

5.5 Rescue and emergency response equipment

If breathing apparatus and/or other equipment is used as rescue and emergency response equipment then it is recommended that the equipment should be suitable for the configuration of the space being surveyed.

5.6 Survey at Sea or at Anchorage

5.6.1 Survey at sea or at anchorage may be accepted, provided the Surveyor is given the necessary assistance from the personnel on board.

Necessary precautions and procedures for performing the survey shall be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.6.2 A communication system shall be arranged between the survey party in the tank and the responsible officer on deck. This system shall include the personnel in charge of ballast pump handling if boats or rafts are used.

5.6.3 Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the Surveyor, who shall take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable sea conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

5.6.4 When rafts or boats are used for close-up survey the following conditions shall be observed:

- **.1** only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- **.2** the boat or raft shall be tethered to the access ladder and an additional person shall be stationed down the access ladder with a clear view of the boat or raft;
- **.3** appropriate lifejackets shall be available to all participants;
- **.4** the surface of water in the tank shall be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account is the level of the water to be rising while the boat or raft is in use;
- **.5** the tank, or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable;
- **.6** at no time is the water level to be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered;
- **.7** if the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft is to be used shall be isolated to prevent a transfer of gas from other tanks (or spaces).

5.6.5 Rafts or boats alone may be allowed for inspection of the under deck areas for tanks or spaces, if the depth of the webs is 1.5 m or less.

5.6.6 If the depth of the webs is more than 1.5, rafts or boats alone may be allowed only:

– when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
– if a permanent means of access is provided in each bay to allow safety entry and exit. This means of access shall be direct from the deck via a vertical ladder and a small platform shall be fitted approximately 2 m below the deck in each bay or a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level shall be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank (see Fig. 4).

If neither of the above conditions are met, then staging or an "other equivalent means" shall be provided for the survey of the under deck areas.

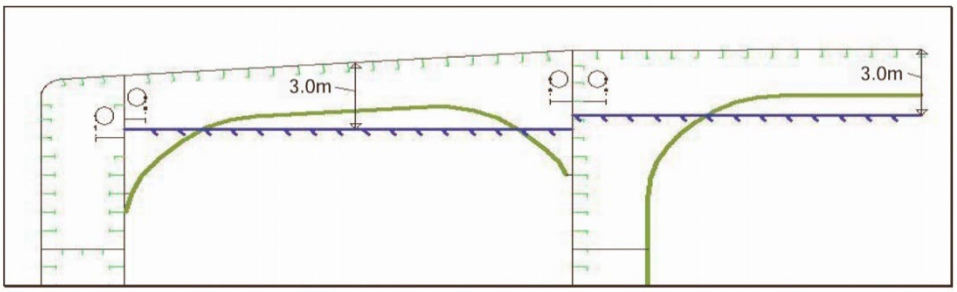


Fig. 4 Maximum water level in a tank

5.6.7 The use of rafts or boats alone in paragraphs 5.6.5 and 5.6.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.7 Survey Planning Meeting

5.7.1 The establishment of proper preparation and the close co-operation between the attending PRS Surveyors and the Owner's representatives on board prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board, safety meetings shall be held regularly.

5.7.2 Prior to commencement of any part of the Renewal and Intermediate Survey, a survey planning meeting shall be held between the attending PRS Surveyor(s), the owner's representative in attendance, the thickness measurement firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be performed. See also 7.1.2.

5.7.3 The following is an indicative list of items that shall be addressed in the meeting:

.1 schedule of the vessel (i.e. the voyage, docking and undocking, manoeuvres, periods alongside, cargo and ballast operations, etc.);
.2 provisions and arrangements for thickness measurements (i.e. access, cleaning/de-scaling, illumination, ventilation, personal safety);
.3 extent of the thickness measurements;
.4 acceptance criteria (refer to the list of minimum thicknesses);

.5 extent of Close-up Survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
.6 execution of thickness measurements;
.7 taking representative readings in general and where uneven corrosion/ pitting is found;
.8 mapping of areas of substantial corrosion;
.9 communication between attending surveyor(s), the thickness measurement firm operator(s) and owner representative(s) concerning findings.

6 DOCUMENTATION ON BOARD

6.1 General

6.1.1 The Owner shall obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which shall be readily available for the PRS Surveyor.

6.1.2 The documentation shall be kept on board for the lifetime of the ship.

6.1.3 For tankers subject to *SOLAS* Chapter II-1, Part A-1, Regulation 3-10, the Owner shall arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF took place. Documented procedures for updating the SCF shall be included within the Safety Management System.

6.2 Survey Report File

6.2.1 Survey Report File shall be a part of the documentation on board consisting of:
– reports of structural surveys,
– *Executive Hull Summary*,
– thickness measurement reports.

6.2.2 Survey Report File shall also be available in the Owner's and PRS offices.

6.3 Supporting Documents

6.3.1 The following additional documentation shall be available on board:
– *Survey Programme* as required by 5.1 until such time as Class Renewal or Intermediate Survey, as applicable, has been completed,
– main structural plans of cargo and ballast tanks (for CSR ships these plans shall include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship shall include the minimum allowable hull girder sectional properties for hold transverse section in all cargo tanks);
– previous repair history;
– cargo and ballast history;
– extent of use of inert gas plant and tank cleaning procedures;
– inspections by ship's personnel with reference to:
  – structural deterioration in general,
  – leakages in bulkheads and piping,
  – condition of coating or corrosion prevention system, if any;
– any other information that will help identify critical structural areas and/or suspect areas requiring inspection.

6.3.2 For tankers subject to *SOLAS* Chapter II-1, Part A-1, Regulation 3-10, the Ship Construction File (SCF), limited to the items to be retained onboard, shall be available on board.

6.4 Review of Documentation on Board

6.4.1 Prior to survey, the Surveyor shall examine the completeness of the documentation on board and its contents as a basis for the survey.

6.4.2 For tankers subject to *SOLAS* Chapter II-1, Part A-1, Regulation 3-10, on completion of the survey, PRS Surveyor shall verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.

6.4.2.1 For the SCF stored on board ship, the surveyor is to examine the information on board ship. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is kept on board the ship. If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.2.2 For the SCF stored on shore archive, the surveyor is to examine the list of information included on shore archive. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification to the ship structures, the surveyor is to also verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship. In addition, the surveyor is to confirm that the service contract with of the Archive Center is valid. If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

6.4.3 For tankers subject to *SOLAS* Chapter II-1, Part A-1, Regulation 3-10, on completion of the survey, PRS Surveyor shall verify, any addition and/or renewal of materials used for construction of the hull structure are documented within the Ship Construction File inventory list.

7 PROCEDURES FOR THICKNESS MEASUREMENTS

7.1 General

7.1.1 Thickness measurements required, if not performed by the PRS itself, shall be witnessed by a Surveyor on board to the extent necessary to control the process.

7.1.2 The thickness measurement firm shall be part of the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required shall be performed simultaneously with close-up surveys.

7.1.4 In all cases the extent of thickness measurements shall be sufficient as to represent the actual average condition.

7.2 Certification of Thickness Measurement Firm

7.2.1 The thickness measurements shall be performed by a qualified firm certified by PRS according to the principles stated in Table VI.

7.3 Number and Locations of Measurements

7.3.1 Application

7.3.1.1 The item 7.3 only applies to ships built under the CSR[1]. For ships not built under CSR, the requirements for number and locations of measurements are according to the PRS Rules and/or Publications depending on ship's age and structural elements concerned.

7.3.2 Number of Measurements

7.3.2.1 Considering the extent of thickness measurements according to the different structural elements of the ship and surveys (renewal, intermediate and annual), the locations of the points to be measured are given for the most important items of the structure.

7.3.3 Locations of Measurements

7.3.3.1 Table 1 provides explanations and/or interpretations for the application of those requirements indicated in the Rules, which refer to both systematic thickness measurements related to the calculation of global hull girder strength and specific measurements connected to Close-up Surveys.

Fig. 5 to fig. 8 are provided to facilitate the explanations and/or interpretations given in table 1, to show typical arrangements of double hull oil tankers.

Table 1
Interpretations of Rule requirements for the locations and number of points to be measured

Item	Interpretation	Figure reference
Selected plates	"Selected" means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion	
Deck, bottom plates and wind and-water strakes	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion	
Transverse section	Measurements to be taken on all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom, longitudinal bulkheads, inner bottom and hopper. One point to be taken on each plate. Both web and flange to be measured on longitudinals, if applicable. For tankers older than 10 years of age: within 0.1*D* (where *D* is the ship's moulded depth) of the deck and bottom at each transverse section to be measured, every longitudinal and girder shall be measured on the web and face plate, and every plate shall be measured at one point between longitudinals.	Fig. 5
Transverse rings (*) in cargo and ballast tanks	At least two points on each plate in a staggered pattern and two points on the corresponding flange where applicable. Minimum 4 points on the first plate below deck. Additional points in way of curved parts. At least one point on each of two stiffeners between stringers / longitudinal girders	Fig. 6

[1] CSR mean IACS Common Structural Rules for Double Hull Oil Tankers (IACS CSR for Oil Tankers) or IACS Common Structural Rules for Bulk Carriers and Oil Tankers (IACS CSR BC&OT).

Item	Interpretation	Figure reference
Transverse bulkheads in cargo tanks	At least two points on each plate. Minimum 4 points on the first plate below main deck. At least one point on every third stiffener to be taken between each stringer. At least two points on each plate of stringers and girders, and two points on the corresponding flange. Additional points in way of curved part. Two points of each diaphragm plate of stools if fitted.	Fig. 7
Transverse bulkheads in ballast tanks	At least 4 points on plates between stringers / longitudinal girders, or per plate if stringers / girders not fitted. At least two points on each plate of stringers and girders, and two points on the corresponding flange. Additional points in way of curved part. At least one point on two stiffeners between each stringer / longitudinal girder.	Fig. 8
Adjacent structural members	On adjacent structural members one point per plate and one point on every third stiffener / longitudinal.	

(*) Transverse rings mean all transverse material appearing in a cross-section of the ship's hull, in way of a double bottom floor, vertical web and deck transverse (definition from CSR).

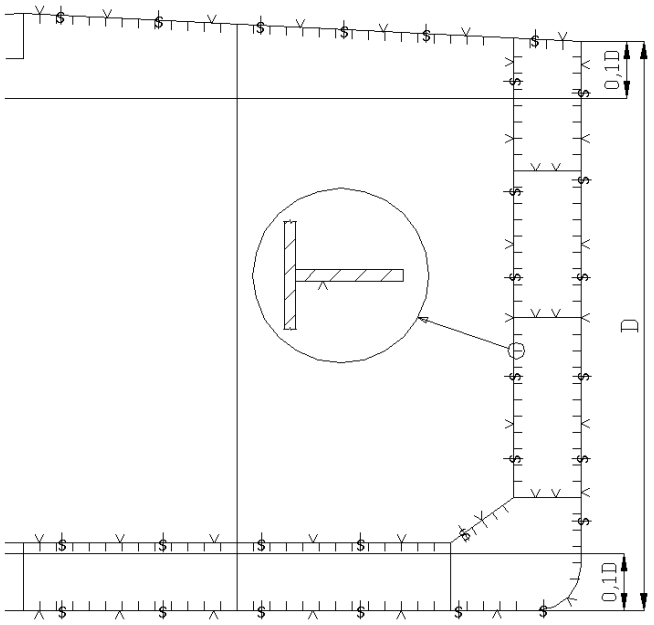


Fig. 5. Transverse section

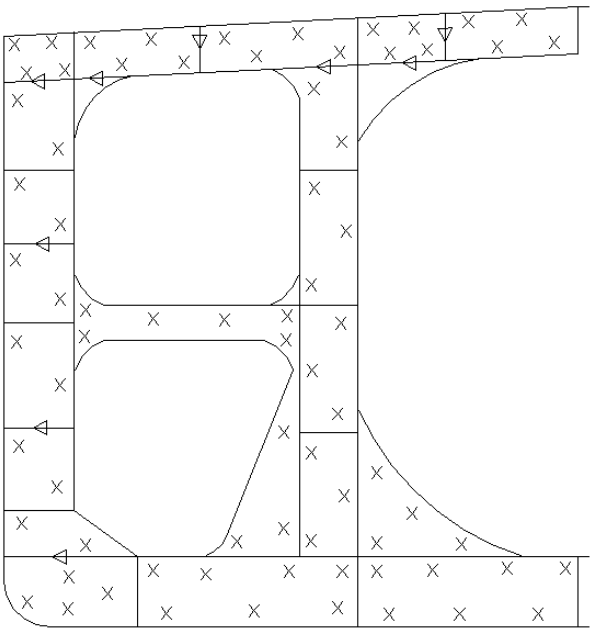


Fig. 6. Transverse rings in cargo and ballast tanks

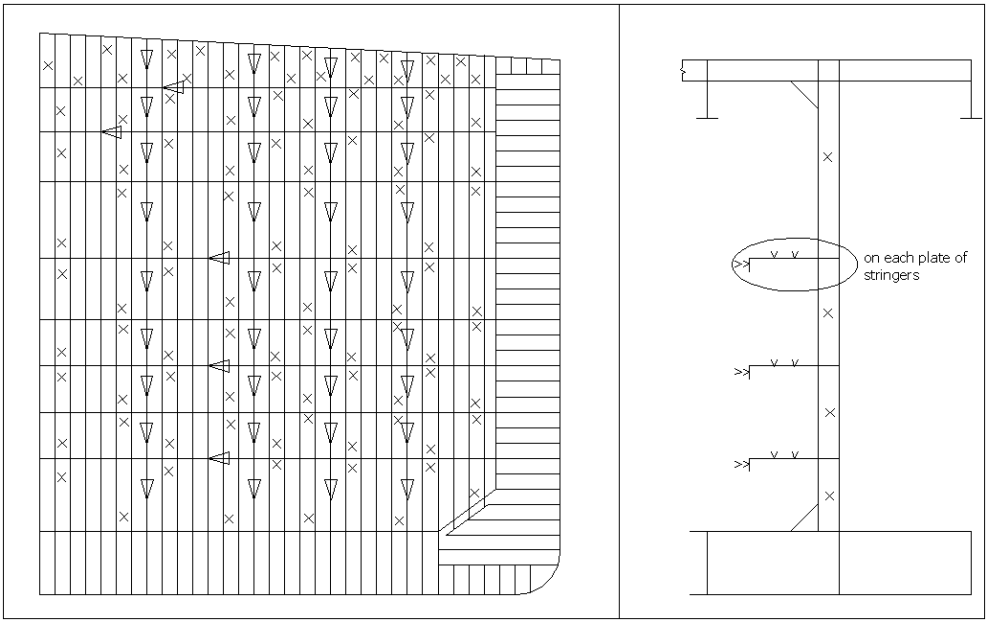


Fig. 7. Transverse bulkheads in cargo tanks

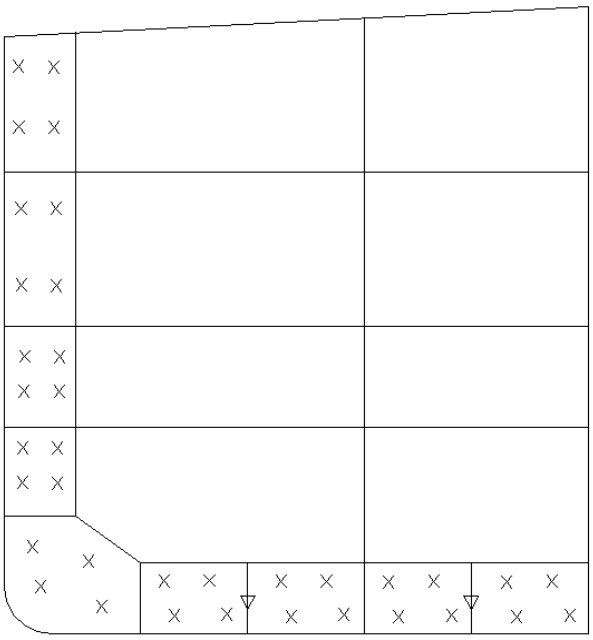


Fig. 8. Transverse bulkheads in ballast tanks

7.4 Reporting

7.4.1 A thickness measurement report shall be prepared and submitted to PRS Surveyor.

The report shall give the location of measurements, the thickness measured as well as corresponding original thickness.

Furthermore, the report shall give the date when measurement was performed, type of measuring equipment, names of personnel and their qualifications and has to be signed by the operator.

The thickness measurement report shall follow the principles specified in the Annex II.

7.4.2 The Surveyor shall review the final thickness measurements report and countersign the cover page.

8 ACCEPTANCE CRITERIA

8.1 General

8.1.1 For ships built under CSR[2], the Acceptance Criteria is according to– Ship in Operation Criteria of *Publication 85/P – Requirements Concerning the Construction and Strength of the Hull and Hull Equipment of Sea-going, Double Hull Oil Tankers of 150 m in Length and above* and as specified in 8.2, 8.3 and 8.4 of this Publication.

8.1.2 For ships not built under CSR, the Acceptance Criteria are according to PRS Rules and PRS Publications depending on ship's age and structural elements concerned.

8.2 Acceptance Criteria for Pitting Corrosion of CSR Ships

8.2.1 For plates with pitting intensity less than 20%, see Fig. 1, the measured thickness, t_m, of any individual measurement shall fulfil the lesser of the following criteria:

[2] Section 12 of IACS CSR for Oil Tankers or Ch. 13, Part 1 of IACS CSR BC&OT.

$$t_m \geq 0.7\ (t_{as\text{-}built} - t_{vol\ add})\ \text{mm}$$

$$t_m \geq t_{ren} - 1\ \text{mm}$$

where:

$t_{as\text{-}built}$ as-built thickness of the member, in mm

$t_{vol\ add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_C

t_{ren} renewal criteria for general corrosion as defined in CSR[3].

8.2.2 The average thickness across any cross section in the plating shall not be less than the renewal criteria for general corrosion given in CSR[4].

8.3 Acceptance Criteria for Edge Corrosion of CSR ships

8.3.1 Provided that the overall corroded height of the edge corrosion of the flange, or web in the case of flat bar stiffeners, is less than 25%, see Figure 2, of the stiffener flange breadth or web height, as applicable, the measured thickness, t_m, shall fulfil the lesser of the following criteria:

$$t_m \geq 0.7\ (t_{as\text{-}built} - t_{vol\ add})\ \text{mm}$$

$$t_m \geq t_{ren} - 1\ \text{mm}$$

where:

$t_{as\text{-}built}$ as-built thickness of the member, in mm

$t_{vol\ add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_C

t_{ren} renewal criteria for general corrosion as defined in CSR[5].

8.3.2 The average measured thickness across the breadth or height of the stiffener shall not be less than that defined in CSR[6].

8.3.3 Plate edges at openings for manholes, lightening holes etc. may be below the minimum thickness given in CSR[7] provided that:

(a) the maximum extent of the reduced plate thickness, below the minimum given in CSR[8], from the opening edge is not more than 20% of the smallest dimension of the opening and does not exceed 100 mm.
(b) rough or uneven edges may be cropped-back provided that the maximum dimension of the opening is not increased by more than 10% and the remaining thickness of the new edge is not less than t_{ren} – 1 mm.

8.4 Acceptance Criteria for Grooving Corrosion of CSR ships

8.4.1 Where the groove breadth is a maximum of 15% of the web height, but not more than 30 mm, see Fig. 3, the measured thickness, t_m, in the grooved area shall fulfil the lesser of the following criteria:

$$t_m \geq 0.75\ (t_{as\text{-}built} - t_{vol\ add})\ \text{mm}$$

3 1.4.2.1 of Section 12 of IACS CSR for Oil Tankers or 2.1.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
4 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
5 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
6 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
7 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
8 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.

$$t_m \geq t_{ren} - 0.5 \text{ mm}$$

but shall not be less than:

$$t_m = 6 \text{ mm}$$

where:

$t_{as\text{-}built}$ as-built thickness of the member, in mm

$t_{vol\ add}$ voluntary thickness addition; thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to t_C

t_{ren} renewal criteria for general corrosion as defined CSR[9].

8.4.2 Structural members with areas of grooving greater than those in 8.4.1 above shall be assessed based on the criteria for general corrosion as defined in CSR[10] using the average measured thickness across the plating/stiffener.

9 REPORTING AND EVALUATION OF SURVEY

9.1 Evaluation of Survey Report

9.1.1 The data and information on the structural condition of the ship, collected during the survey, shall be evaluated for acceptability and continued structural integrity of the ship.

9.1.1.1 In case of double hull oil tankers of 130 m in length and upwards (as defined in the *International Convention on Load Lines*), ship's longitudinal strength shall be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the Class Renewal Survey performed after the ship reached 10 years of age in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in Annex III.

9.1.1.2 The final result of evaluation of the ship's longitudinal strength required in 9.1.1.1, after renewal or reinforcement work of structural members, if performed as a result of initial evaluation, shall be reported as a part of the *Executive Hull Summary* (Forms 328HS and 328.1HS).

9.2 Reporting

9.2.1 Principles for survey reporting are shown in Table VII.

9.2.2 When a survey is split between different survey stations, a report shall be made for each portion of the survey. A list of items examined and/or tested (pressure testing, thickness measurements etc.) and an indication of whether the item has been credited, shall be made available to the next attending Surveyor(s), prior to continuing or completing the survey.

9.2.3 An *Executive Hull Summary* of the survey and results shall be issued to the Owner on PRS Form No. 328HS – *Executive Hull Summary* and placed on board the ship for reference at future surveys.

The *Executive Hull Summary* shall be endorsed by the PRS Head Office.

[9] 1.4.2.1 of Section 12 of IACS CSR for Oil Tankers or 2.1.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.
[10] 1.4.2 of Section 12 of IACS CSR for Oil Tankers or 2.1 of Sec. 2, Ch. 13, Part 1 of IACS CSR BC&OT.

Table I

MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEYS AT CLASS RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS

Class Renewal Survey No. 1 Age ≤ 5 years	Class Renewal Survey No. 2 5 < Age ≤ 10 years	Class Renewal Survey No. 3 10 < Age≤ 15 years	Class Renewal Survey No. 4 and subsequent Age > 15 years
One web frame (1) in a ballast tank (see Note 1)	All web frames (1) in a ballast tank (see Note 1). The knuckle area and the upper part (5 metres approximately) of one web frame in each remaining ballast tank (6)	All web frames (1) in all ballast tanks	As III Class Renewal Survey
One deck transverse, in a cargo oil tank (2)	One deck transverse, in two cargo oil tanks (2)	All web frames (7) including deck transverse and cross ties, if fitted, in one cargo oil tank. One web frame (7) including deck transverse and cross ties, if fitted, in each remaining cargo oil tank	Additional transverse areas as deemed necessary by PRS
One transverse bulkhead (4) in one ballast tank (see Note 1)	One transverse bulkhead (4) in each ballast tank (see Note 1)	All transverse bulkheads in all cargo oil (3) and ballast (4) tanks	
One transverse bulkhead (5) in one cargo oil centre tank	One transverse bulkhead (5) in two cargo oil centre tanks		
One transverse bulkhead (5) in one cargo oil wing tank (see Note 2)	One transverse bulkhead (5) in one cargo oil wing tank (see Note 2)		

(1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see Figure 9 and Figure 10).

(1) Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.

(2) Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).

(3) Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.

(4) Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tanks, inner bottom plating, hopper side, connecting brackets.

(5) Transverse bulkhead lower part in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.

(6) The *knuckle area* and the upper part (5 metres approximately), including adjacent structural members. *Knuckle area* is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.

(7) Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

Note 1 Ballast tank Apart from the fore and aft peak tanks, the term "ballast tank" has the following meaning:

.1 all ballast compartments (hopper tank, side tank and double-deck tank, if separate from double-bottom tank) located on one side, i.e. portside or starboard side, and additionally double-bottom tank on portside plus starboard side, when the longitudinal central girder is not watertight and, therefore, the double bottom tank is a unique compartment from portside to starboard side; or

.2 all ballast compartments (double-bottom tank, hopper tank, side tank and double-deck tank) located on one side, i.e. portside or starboard side, when the longitudinal central girder is watertight and, therefore, the portside double-bottom tank separate from the starboard-side double-bottom tank."

Note 2 Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks shall be surveyed.

Table II

MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT CLASS RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS

Class Renewal Survey No. 1 Age ≤ 5 years	Class Renewal Survey No. 2 5 < Age ≤ 10 years	Class Renewal Survey No. 3 10 < Age ≤ 15 years	Class Renewal Survey No.4 and subsequent Age > 15 years
1. Suspect areas	1. Suspect areas	1. Suspect areas	1. Suspect areas
	2. Within the cargo area: – each deck plate, – one transverse section	2. Within the cargo area: – each deck plate, – two transverse sections (1), – all wind and water strakes	2. Within the cargo area: – each deck plate, – three transverse sections (1), – each bottom plate
	3. Selected wind and water strakes outside the cargo area	3. Selected wind and water strakes outside the cargo area	3. All wind and water strakes, full length
	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I	4. Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table I
(1) at least one section shall include a ballast tank within 0.5*L* amidships			

Table III

MINIMUM REQUIREMENTS FOR TANK TESTING AT CLASS RENEWAL SURVEY OF DOUBLE HULL OIL TANKERS

Class Renewal Survey No. 1 Age ≤ 5 years	Class Renewal Survey No. 2 and subsequent Age > 5
All ballast tank bulkheads	All ballast tank bulkheads and decks
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank boundaries

Table IV/ Sheet 1

REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION

Class Renewal Survey of double hull oil tankers within the cargo area length

BOTTOM, INNER BOTTOM AND HOPPER STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
1	2	3
Bottom, inner bottom and hopper structure plating	Minimum of 3 bays across double bottom tank, including aft bay. Measurements around and under all section bell mouths	5-point pattern for each panel between longitudinals and webs

1	2	3
Bottom, inner bottom and hopper structure longitudinals	Minimum of 3 longitudinals in each bay where bottom plating measured	3 measurements in line across flange and 3 measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements.
Bottom floors, including the watertight ones	3 floors in bays where bottom plating measured, with measurements at both ends and in the middle	5-point pattern over 2 square metre area
Hopper structure web frame ring	3 floors in bays where bottom plating measured	5-point pattern over 1 square metre of plating. Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	Lower 1/3 of bulkhead	5-point pattern over one square metres of plating
	Upper 2/3 of bulkhead	5-point pattern over two square metres of plating
	Stiffeners (minimum of three)	For web, 5-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

Table IV/ Sheet 2

REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION

Class Renewal Survey of double hull oil tankers within the cargo area length

DECK STRUCTURE		
Structural member	Extent of measurement	Pattern of measurement
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets (usually in cargo tanks only)	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. 5-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	5-point pattern over one square metre area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (2 metres from deck)	Minimum of two webs, and both transverse bulkheads	5-point pattern over one square meter area
Panel stiffening	Where applicable	Single measurements

Table IV/ Sheet 3

REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION

Class Renewal Survey of double hull oil tankers within the cargo area length

STRUCTURE IN WING BALLAST TANKS		
Structural member	Extent of measurement	Pattern of measurement
Side shell and longitudinal bulkhead plating: – upper strake and strakes in way of horizontal girders – all other strakes	 – plating between each pair of longitudinals in a minimum of three bays (along the tank) – plating between every third pair of longitudinals in same three bays	 – single measurement – single measurement
Side shell and longitudinal bulkhead longitudinals on: – upper strake – all other strakes	 – each longitudinal in same three bays – every third longitudinal in same three bays	 – 3 measurements across web and 1 measurement on flange – 3 measurements across web and 1 measurement on flange
Longitudinals – brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket
Vertical web and transverse bulkheads (excluding deckhead area): – strakes in way of horizontal girders – other strakes	 – minimum of two webs and both transverse bulkheads – minimum of two webs and both transverse bulkheads	 – 5-point pattern over approx. two square metre area – two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

Table IV/ Sheet 4

REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION

Class Renewal Survey of double hull oil tankers within the cargo area length

LONGITUDINAL BULKHEADS IN CARGO TANKS		
Structural member	Extent of measurement	Pattern of measurement
Deckhead and bottom strakes, and strakes in way of the horizontal stringers of transverse bulkheads	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
Longitudinals on deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
All other longitudinals	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
Longitudinals – brackets	Minimum of three at top, middle and bottom of tank in same three bays	5-point pattern over area of bracket

LONGITUDINAL BULKHEADS IN CARGO TANKS		
Structural member	Extent of measurement	Pattern of measurement
Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	5-point pattern over approximately two square metre area of webs, plus single measurements on flanges of web frame and cross ties
Lower end brackets (opposite side of web frame)	Minimum of three brackets	5-point pattern over approximately two square metre area of brackets, plus single measurements on bracket flanges

Table IV/ Sheet 5

REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS OF SUBSTANTIAL CORROSION

Class Renewal Survey of double hull oil tankers within the cargo area length

TRANSVERSE WATERTIGHT AND SWASH BULKHEADS IN CARGO TANKS		
Structural member	Extent of measurement	Pattern of measurement
Upper and lower stool, where fitted	– Transverse band within 25 mm of welded connection to inner bottom/deck plating. – Transverse band within 25 mm of welded connection to shelf plate	5-point pattern between stiffeners over one meter length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately 1/4, 1/2 and 3/4 width of tank	5-point pattern between stiffeners over one metre length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange or fabricated connection	5-point pattern over about one square meter of plating
Stiffeners	Minimum of three typical stiffeners	For web, 5-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of three at top, middle and bottom of tank	5-point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle	5-point pattern over one square metre area, plus single measurements near bracket toes and on flanges

Table V

MINIMUM REQUIREMENTS FOR OVERALL AND CLOSE-UP SURVEYS AND THICKNESS MEASUREMENTS AT INTERMEDIATE SURVEY OF DOUBLE HULL OIL TANKERS

Age of ship at time of Intermediate Survey due date		
5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
See 3.2.2	See 3.2.3	See 3.2.4
Overall survey of representative ballast tanks selected by the attending surveyor	The requirements of the previous Special Survey	The requirements of the previous Special Survey
Suspect areas identified at previous surveys shall be examined		

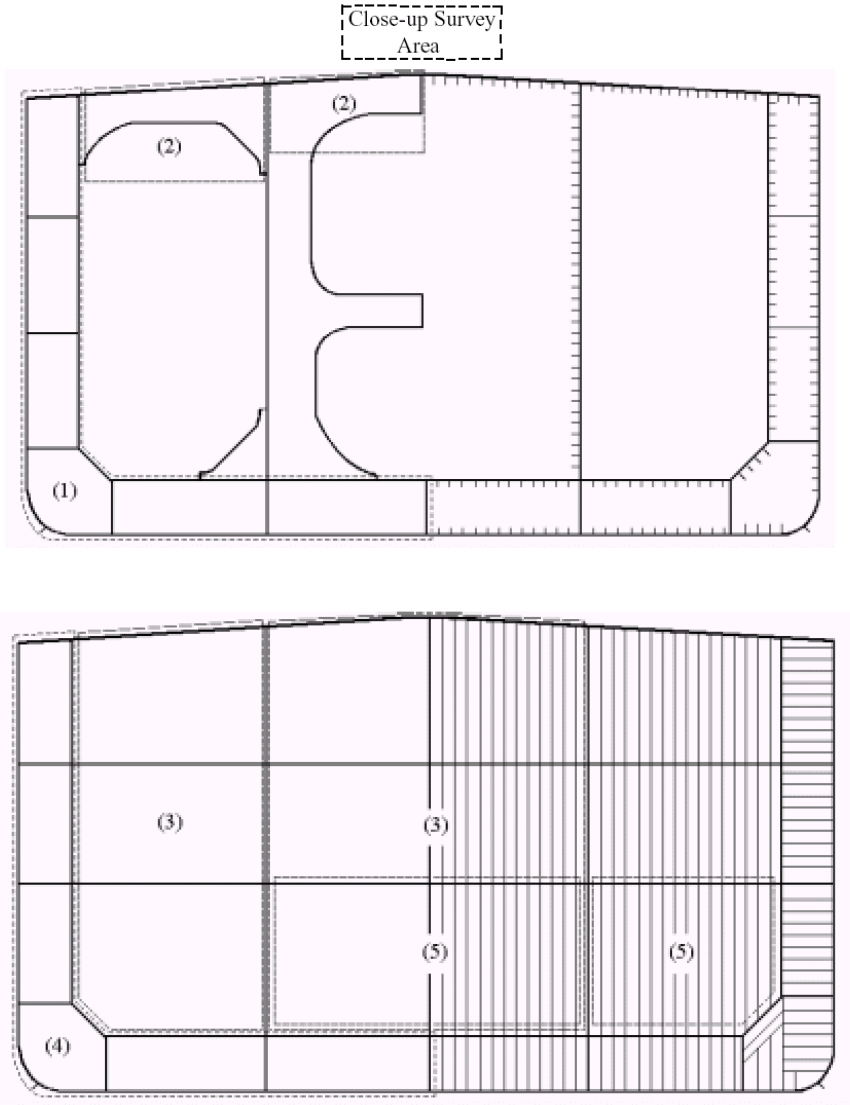


Fig. 9. Close-up Survey requirements for double hull oil tankers. Areas (1) to (5)

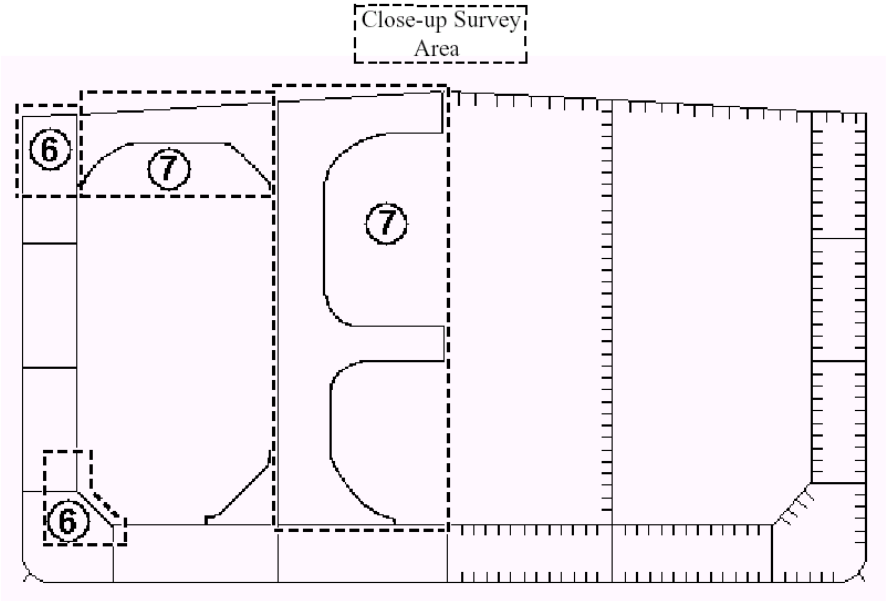


Fig. 10. Close-up Survey requirements for double hull oil tankers. Areas (6) to (7)

Table VI

PROCEDURES FOR CERTIFICATION OF FIRMS ENGAGED IN THICKNESS MEASUREMENTS OF HULL STRUCTURES

1 APPLICATION

This guidance applies to certification of the firms which intend to engage in the thickness measurement of hull structure of the vessels.

2 PROCEDURES FOR CERTIFICATION

2.1 Submission of Documents

The following documents shall be submitted to PRS HO for approval:
- outline of firm, e.g. organization and management structure;
- experience of the firm on thickness measurement, inter alia, of hull structures of the ship;
- technicians careers, i.e. experiences of technicians as thickness measurement operators, technical knowledge of hull structure, etc. Operators shall be qualified according to recognized industrial NDT Standard;
- equipment used for thickness measurement such as ultrasonic testing machines and its maintenance/ calibration procedures;
- a guide for thickness measurement operators;
- training programmes of technicians for thickness measurement;
- measurement record format in accordance with PRS recommended procedures for thickness measurement of double hull oil tankers (see Annex II).

2.2 Auditing the Firm

Upon reviewing the submitted documents with satisfactory results, the firm is audited in order to ascertain that the firm is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurements of the hull construction of the ships.

2.3 Demonstration

Certification is conditional on an on board demonstration of thickness measurements, as well as satisfactory reporting.

3 CERTIFICATION

3.1 Upon satisfactory results of both the audit of the firm in (2.2) and the demonstration tests in (2.3) above, PRS will issue a *Certificate of Approval*, as well as a notice to the effect that the thickness measurement operation system of the firm has been certified by PRS.

Note: Details concerning approval of firms engaged in thickness measurement of hull structures are included in *Publication 51/P – Procedural Requirements for Service Suppliers.*

3.2 Renewal/endorsement of the Certificate shall be made at intervals not exceeding 3 years by verification that original conditions are maintained.

4 INFORMATION ON ANY ALTERATION TO THE CERTIFIED THICKNESS MEASUREMENT OPERATION SYSTEM

In case where any alteration to the certified thickness measurement operation system of the firm is made, such an alteration shall be immediately reported to PRS. Re-audit is made where deemed necessary by PRS.

5 CANCELLATION OF APPROVAL

Approval may be cancelled in the following cases:
- where the measurements were improperly performed or the results were improperly reported;
- where the PRS Surveyor found any deficiencies in the approved thickness measurement operation system of the firm;
- where the firm failed to inform on any alteration in 4 above to PRS.

Table VII

REPORTING PRINCIPLES

As a principle, for oil tankers subject to ESP, PRS Surveyor shall include the following content in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General

1.1 A survey report shall be generated in the following cases:
- in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. Annual, Intermediate and Special surveys, as relevant;
- when structural damages / defects have been found;
- when repairs, renewals or modifications have been performed;
- when conditions of class have been issued or deleted.

1.2 The purpose of reporting is to provide:
- evidence that prescribed surveys have been performed in accordance with applicable PRS Rules;
- documentation of surveys performed with findings, repairs performed and conditions of class issued or deleted;

- survey records, including actions taken, which shall form an auditable documentary trail. Survey reports shall be kept in Survey Report File required to be on board;
- information for planning of future surveys;
- information which may be used as input for maintenance of classification rules and instructions.

When a survey is split between different survey stations, a report shall be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, shall be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing performed is also to be listed for the next Surveyor.

2 Extent of Survey

2.1 Identification of compartments where an Overall Survey has been performed.

2.2 Identification of locations, in each tank, where a Close-up Survey has been performed, together with information of the means of access used.

2.3 Identification of locations, in each tank, where thickness measurement has been performed.

Note: As a minimum, the identification of location of Close-up Survey and thickness measurement shall include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in this Publication based on type of periodical survey and the ship's age. Where only partial survey is required, i.e. one web frame ring/one deck transverse, the identification shall include location within each tank by reference to frame numbers.

2.4 For areas in tanks where protective coating is found to be in GOOD condition and the extent of Close-up Survey and/or thickness measurement has been specially considered, structures subject to special consideration shall be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within cargo and ballast tanks, pump rooms, pipe tunnels and void spaces, where:

- examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been performed;
- operational test to working pressure has been performed.

3 Result of the Survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

3.2 Structural condition of each compartment with information on the following, as relevant:

.1 Identification of findings, such as:
- corrosion with description of location, type and extent;
- areas with substantial corrosion;
- cracks/fractures with description of location and extent;
- buckling with description of location and extent;
- indents with description of location and extent

.2 Identification of compartments where no structural damages/defects are found.

The report may be supplemented by sketches/photos.

3.3 Thickness measurement report shall be verified and signed by the Surveyor controlling the measurements on board.

3.4 Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data are to be included, as relevant:
- measured and as-built transverse sectional areas of deck and bottom flanges;
- diminution of transverse sectional areas of deck and bottom flanges;
- details of renewals or reinforcements performed, as relevant (as per 4.2).

4 Actions Taken with Respect to Findings

4.1 Whenever the attending Surveyor is of the opinion that repairs are required, each item to be repaired shall be identified in the survey report. Whenever repairs are performed, details of the repairs effected shall be reported by making specific reference to relevant items in the survey report.

4.2 Repairs performed shall be reported with identification of:
- compartment;
- structural member;
- repair method (i.e. renewal or modification) including:
  - steel grades and scantlings (if different from the original);
  - sketches/photos, as appropriate;
- repair extent,
- NDT / tests.

4.3 For repairs not completed at the time of survey, a condition of class shall be issued with a specific time limit for the repairs. In order to provide correct and proper information to the Surveyor attending for survey of the repairs, conditions of class shall be sufficiently detailed with identification of each item to be repaired.

For identification of extensive repairs, reference may be given to the survey report.

5 Forms

To fulfil the reporting requirements resulting from Hull Survey of Oil Tanker the following Forms should be used:
328Z – Oil Tanker Hull Survey Report (renewal),
328.1Z – Oil Tanker Hull Survey Report (annual/intermediate),
328HS – Executive Hull Summary,
328.1HS – Preliminary Executive Hull Summary,
328DP – Data on Hull Surveys,
DSR – Data Sheet for Reporting,

Other related to survey reports (e.g. 305).

Table VIII

EXECUTIVE HULL SUMMARY

Forms 328HS and 328.1HS shall be used.

Annex I

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH PLANNING FOR ENHANCED SURVEYS OF DOUBLE HULL OIL TANKERS

CLASS RENEWAL SURVEY – HULL

Contents

References:

1. IACS Recommendation No. 96

2. TSCF, Guidance Manual for the Inspection and Condition Assessment of Double Hull Oil Tanker Structures, 1995.
3. TSCF, Condition Manual for Tanker Structures, 1997.

1 INTRODUCTION

These guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced Class Renewal Surveys of double hull oil tankers.

As stated in 5.1.5 of this Publication, the guidelines are a recommended tool which may be invoked at the discretion of PRS, when considered necessary and appropriate, in conjunction with the preparation of the required *Survey Programme*.

2 PURPOSE AND PRINCIPLES

2.1 Purpose

The purpose of the technical assessment described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage.

This information may be useful in nominating locations, areas and tanks for thickness measurements, close-up surveys and tank testing.

Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

2.2 Minimum Requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurements, Close-up Survey and tank testing contained in Tables I, II and III, respectively of this Publication, which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessment described in these guidelines should be worked out by the Owner or operator in co-operation with PRS well in advance of the commencement of the Class Renewal Survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be Considered

Technical assessment, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- design features such as stress levels on various structural elements, design details and extent of use of high tensile steel;
- former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship, as well as similar vessels, where available;
- information with respect to types of cargo carried, use of different tanks for cargo/ballast, anti-corrosion protection of tanks and condition of coating, if any.

Technical assessment of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognised principles and practices, such as may be found in publications of the Tanker Structure Co-operative Forum (TSCF), Refs. 2 and 3.

3 TECHNICAL ASSESSMENT

3.1 General

There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys: corrosion, cracks and buckling.

Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and are assumed to be dealt with as a normal routine by Surveyors.

Technical assessment performed in conjunction with the survey planning process should, in principle, be as shown schematically in Fig. 1.

The approach is basically an evaluation of the risk in the following aspects based on the knowledge and experience related to design and corrosion.

The design shall be considered with respect to structural items which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design Details

Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

Typical damage experience to be considered will consist of:
- number, extent, location and frequency of cracks.
- location of buckles.

This information may be found in the survey reports and/or the Owner's files, including the results of the Owner's own inspections. The defects should be analysed, noted and marked on sketches.

In addition, general experience should be utilized. For example, reference shall be made to the two TSCF publications – Ref. 2 and 3, which contain a catalogue of typical damages and proposed repair methods for various tanker structural details.

Such figures shall be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is given in Figure 2. In particular, Chapter 3 of Ref. 2 deals with various aspects specific to double hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which shall be considered in working out the survey planning.

The review of the main structural drawings, in addition to using the above mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

The use of high tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

In this respect, stress calculations of typical and important components and details, in accordance with the latest *Rules* or other relevant methods, may prove useful and should be considered.

The selected areas of the structure identified during this process shall be recorded and marked on the structural drawings to be included in the *Hull Survey Programme*.

3.2.2 Corrosion

In order to evaluate relative corrosion risks, the following information is generally to be considered:
- usage of tanks and spaces,
- condition of coatings,
- cleaning procedures,
- previous corrosion damage,
- ballast use and time for cargo tanks,
- corrosion risk scheme (see Ref. 3, Table 2.1),
- location of heated tanks.

Definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions, are given in TSCF Ref. 3.

The evaluation of corrosion risks should be based on information in Ref. 3, together with relevant information on the anticipated condition of the ship derived from the information collected in order to prepare the *Survey Programme* and the age of the ship.

The various tanks and spaces should be listed with the corrosion risks nominated accordingly. Special attention shall be given to the areas where the double hull tanker is particularly exposed to corrosion. To this end, the specific aspects addressing corrosion in double hull tankers indicated in 3.4 (Corrosion trends) of Ref. 2 shall be taken into account.

3.2.3 Locations for Close-up Survey and Thickness Measurement

On the basis of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

The sections subject to thickness measurement shall normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

The nomination of tanks and spaces for Close-up Survey shall, initially, be based on the highest corrosion risk, and shall always include ballast tanks. The principle for the selection shall be that the extent is increased by age or where information is insufficient or unreliable.

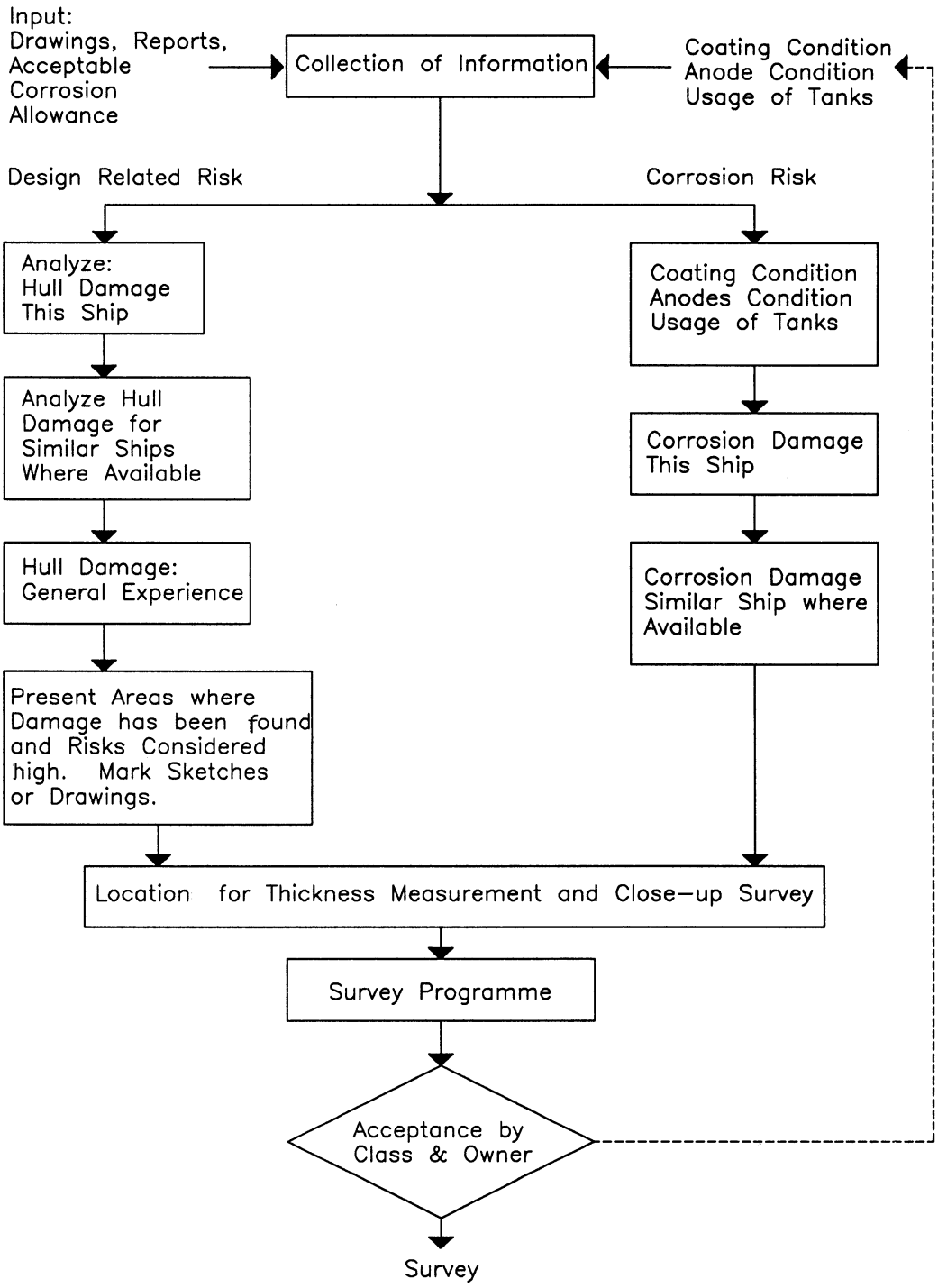


Fig. 1. Technical assessment and the survey planning process

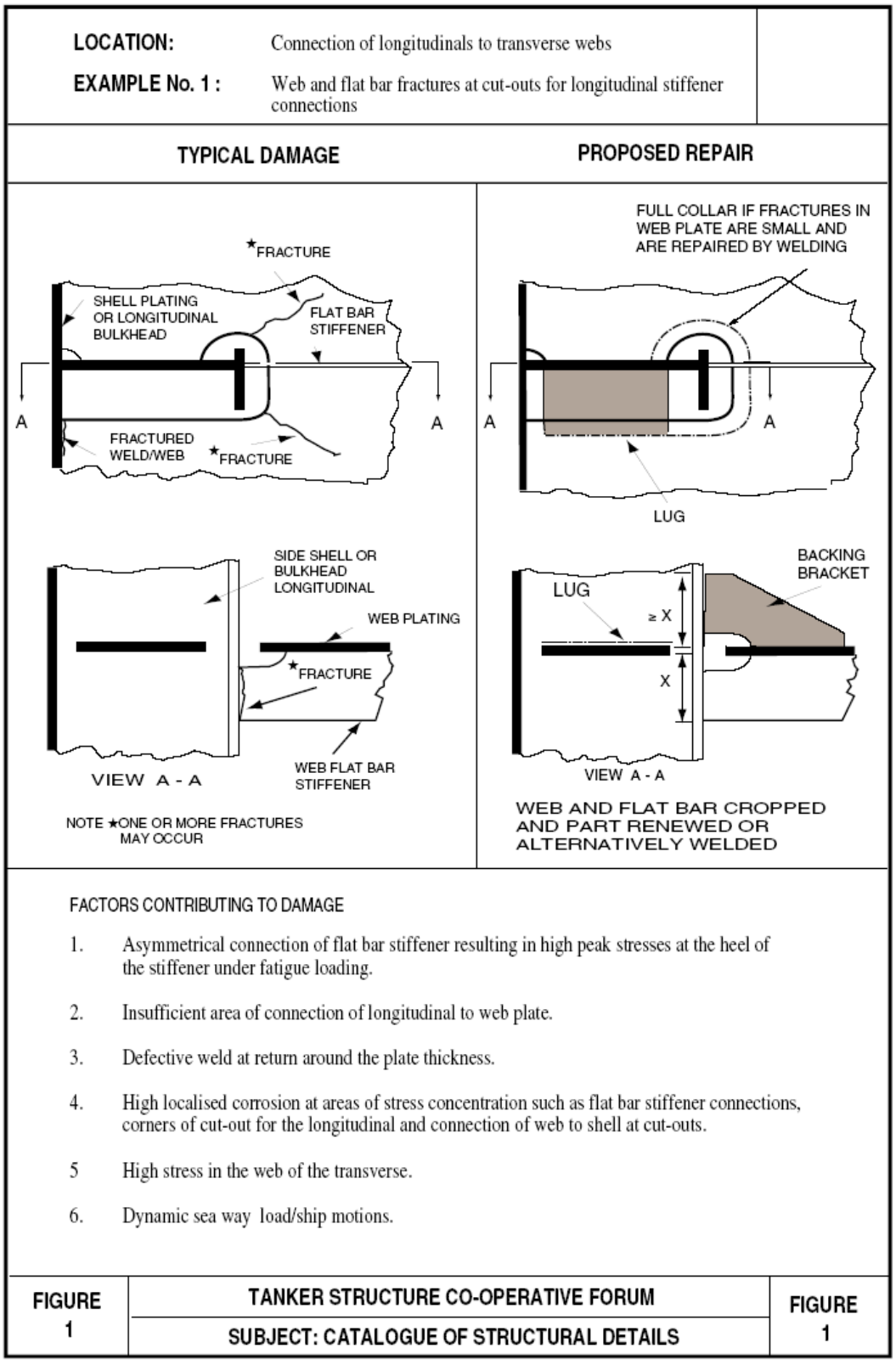


Fig. 2. Typical damage and repair example (reproduced from Ref. 2)

Annex II

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE HULL OIL TANKERS

Instructions

1. This, not mandatory, document shall be used for recording thickness measurements as required by this Publication.
2. Reporting forms TM1-DHT, TM2-DHT, TM3-DHT, TM4-DHT, TM5-DHT and TM6-DHT shall be used for recording thickness measurements and the maximum allowable diminution should be stated.

   The maximum allowable diminution could be stated in an attached document.

3. The remaining forms (sheets No. 1, 2, 3, 4 and 5) are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurements.

CONTENTS:

General particulars

Reporting forms

- TM1-DHT Report on thickness measurement of all deck plating, all bottom shell plating or side shell plating.
- TM2-DHT (I) Report on thickness measurement of shell and deck plating – Strength deck and sheerstrake plating.
- TM2-DHT (II) Report on thickness measurement of shell and deck plating at transverse sections – Shell plating.
- TM3-DHT Report on thickness measurement of longitudinal members at transverse sections (including double hull plating).
- TM4-DHT Report on thickness measurement of transverse structural members.
- TM5-DHT Report on thickness measurement of watertight/oiltight transverse bulkheads.
- TM6-DHT Report on thickness measurement of miscellaneous structural members.

Guidance diagrams and notes

- Typical transverse section of a double hull oil tanker (up to 150,000 dwt). The diagram includes details of the items to be measured and the report forms to be used.
- Typical transverse section of a double hull oil tanker (above 150,000 dwt). The diagram included details of the items to be measured and the report forms to be used.
- Transverse section outline. The diagram may be used for those ships where the diagrams on page 56 and page 57 are not suitable.
- Transverse section and transverse bulkheads of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (1) to (5) as defined in Table I of this Publication.
- Transverse section of a double hull oil tanker showing typical areas for thickness measurement in association with close-up survey requirements, areas (6) to (7) as defined in Table I of this Publication.

GENERAL PARTICULARS

Ship's name:

IMO number:

PRS reg. No.:

Port of registry:

Gross tons:

Deadweight:

Date of build:

Classification society:

Name of firm performing thickness measurement:

Thickness measurement firm certified by:

Certificate No:

Certificate valid from …….. to ……..……..

Place of measurement:

First date of measurement:

Last date of measurement:

Class renewal survey/intermediate survey due:*

Details of measurement equipment:

Qualification of operator:

Report Number consisting of sheets

Name of operator: ..... Name of Surveyor: .....

Signature of operator:..... Signature of Surveyor:.....

Firm official stamp: PRS stamp:

* Delete as appropriate

TM1-DHT **Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM SHELL PLATING or SIDE SHELL PLATING***

(* – delete as appropriate)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRAKE POSITION																	
PLATE POSITION	No. or Letter	Org. Thick. mm	Forward reading						Aft reading						Mean diminution %		Maximum allowable diminution
			Gauged		Diminution P		Diminution S		Gauged		Diminution P		Diminution S				
			P	S	mm	%	mm	%	P	S	mm	%	mm	%	P	S	mm
12th forward																	
11th																	
10th																	
9th																	
8th																	
7th																	
6th																	
5th																	
4th																	
3rd																	
2nd																	
1st																	
Amidships																	
1st aft																	
2nd																	
3rd																	
4th																	
5th																	
6th																	
7th																	
8th																	
9th																	
10th																	
11th																	
12th																	

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM1-DHT)

1. This report shall be used for recording the thickness measurement of:

   A – All strength deck plating within the cargo area.

   B – All keel, bottom shell plating and bilge plating within the cargo area.

   C – Side shell plating including the selected wind and water strakes outside cargo area.

   D – All wind and water strakes within cargo area.

2. The strake position shall be clearly indicated as follows:

   2.1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.

   2.2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.

   2.3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.

3. Measurements shall be taken at the forward and aft areas of all plates and where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank shall be recorded.

4. The single measurements recorded shall represent the average of multiple measurements.

5. The maximum allowable diminution could be stated in an attached document.

TM2-DHT (I)

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRENGTH DECK AND SHEERSTRAKE PLATING																														
STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER									SECOND TRANSVERSE SECTION AT FRAME NUMBER									THIRD TRANSVERSE SECTION AT FRAME NUMBER												
	No. or Letter	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S				
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%		
Stringer Plate																														
1st strake inboard																														
2nd																														
3rd																														
4th																														
5th																														
6th																														
7th																														
8th																														
9th																														
10th																														
11th																														
12th																														
13th																														
14th																														
centre strike																														
sheer strike																														
TOPSIDE TOTAL																														

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM2-DHT (I))

1. This report form shall be used for recording the thickness measurement of:

   Strength deck plating and sheerstrake plating transverse sections:

   One, two or three sections within the cargo area comprising the structural items (0), (1), and (2) as shown on the diagrams of typical transverse sections on Sheets 1 and 2, pages 56 and 57.

2. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).

3. The exact frame station of measurement shall be stated.

4. The single measurements recorded shall represent the average of multiple measurements.

5. The maximum allowable diminution could be stated in an attached document.

TM2-DHT (II)

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Ship's name ..... PRS' reg. No. ..... Report No. .....

SHELL PLATING																													
STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER									SECOND TRANSVERSE SECTION AT FRAME NUMBER									THIRD TRANSVERSE SECTION AT FRAME NUMBER										
	No. or Letter	Org. Thick	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thick	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		No. or Letter	Org. Thick	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S			
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%		
1st below sheer strake																													
2nd																													
3rd																													
4th																													
5th																													
6th																													
7th																													
8th																													
9th																													
10th																													
11th																													
12th																													
13th																													
14th																													
15th																													
16th																													
17th																													
18th																													
19th																													
20th																													
keel strake																													
BOTTOM TOTAL																													

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM2-DHT (II))

1. This report form shall be used for recording the thickness measurements of:
   Shell plating transverse sections:

   One, two or three sections within the cargo area comprising the structural items (3), (4), (5) and (6) as shown on the diagrams of typical transverse sections on Sheets 1 and 2, pages 56 and 57.
2. The bottom area comprises keel, bottom and bilge plating.
3. The exact frame station of measurement shall be stated.
4. The single measurements recorded shall represent the average of multiple measurements.
5. The maximum allowable diminution could be stated in an attached document.

TM3-DHT

Report on THICKNESS MEASUREMENT of LONGITUDINAL MEMBERS (one, two or three transverse sections)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRUCTURAL MEMBER	FIRST TRANSVERSE SECTION AT FRAME NUMBER									SECOND TRANSVERSE SECTION AT FRAME NUMBER									THIRD TRANSVERSE SECTION AT FRAME NUMBER								
	Item No.	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		Item No.	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		Item No.	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%		mm	mm	P	S	mm	%	mm	%

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM3-DHT)

1. This report form shall be used for recording the thickness measurement of:

   Longitudinal Members at transverse sections:

   One, two or three sections within the cargo area comprising the appropriate structural items (10) to (29) as shown on the diagrams of typical transverse sections on Sheets 1 and 2, pages 56 and 57.

2. The exact frame station of measurement shall be stated.

3. The single measurements recorded shall represent the average of multiple measurements.

4. The maximum allowable diminution could be stated in an attached document.

TM4-DHT

Report on THICKNESS MEASUREMENT of TRANSVERSE STRUCTURAL MEMBERS
In the cargo oil and water ballast tanks within the cargo tank length

Ship's name ..... PRS' reg. No. ..... Report No. .....

TANK DESCRIPTION:									
LOCATION OF STRUCTURE:									
STRUCTURAL MEMBER	ITEM	Original Thickness	Max. Allwb. Dim.	Gauged		Diminution P		Diminution S	
		mm	mm	P	S	mm	%	mm	%

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM4-DHT)

1. This report form shall be used for recording the thickness measurement of :

   Transverse structural members, comprising the appropriate structural items (30) to (36) as shown on diagrams of typical transverse section on Sheets 1 and 2, pages 56 and 57.

2. Guidance for areas of measurement is indicated on Sheets 4 and 5, page 59 and 60 of this Publication.

3. The single measurements recorded shall represent the average of multiple measurements.

4. The maximum allowable diminution could be stated in an attached document.

TM5-DHT

Report on THICKNESS MEASUREMENT of W.T./O.T. TRANSVERSE BULKHEADS within the cargo tank or cargo hold spaces

Ship's name ..... PRS' reg. No. ..... Report No. .....

TANK/HOLD DESCRIPTION:								
LOCATION OF STRUCTURE:				FRAME NO.:				
STRUCTURAL COMPONENT (PLATING/STIFFENER)	Original Thickness	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S	
	mm	mm	Port	Starboard	mm	%	mm	%

Operator's Signature .....

NOTES – See next page

NOTES

(to the Report TM5-DHT)

1. This report form shall be used for recording the thickness measurement of: W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on Sheet 4, page 59 of this Publication.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The maximum allowable diminution could be stated in an attached document.

TM6-DHT

Report on THICKNESS MEASUREMENT of MISCELLANEOUS STRUCTURAL MEMBERS

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRUCTURAL MEMBER:									SKETCH
LOCATION OF STRUCTURE:									
Description	Org. Thick.	Max. Alwb. Dim.	Gauged		Diminution P		Diminution S		
	mm	mm	P	S	mm	%	mm	%	

Operator's Signature .....

NOTES – See next page

NOTES

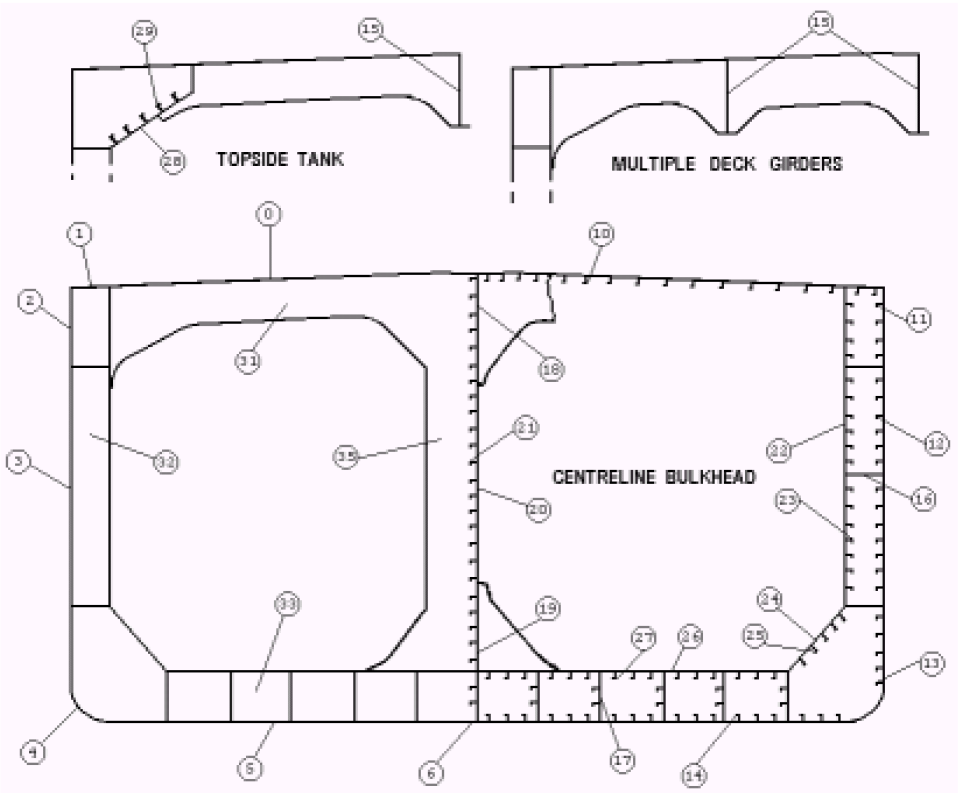
(to the Report TM6-DHT)

1. This report form shall be used for recording the thickness measurement of miscellaneous structural members.
2. The single measurements recorded shall represent the average of multiple measurements.
3. The maximum allowable diminution could be stated in an attached document.

Sheet 1

Thickness measurement – double hull oil tankers

Typical transverse section of a double hull tanker up to 150000 dwt indicating longitudinal and transverse members



Report on TM2-DHT (i) & (ii)
0. Strength deck plating
1. Stringer plate
2. Sheerstrake
3. Side shell plating
4. Bilge plating
5. Bottom shell plating
6. Keel plate

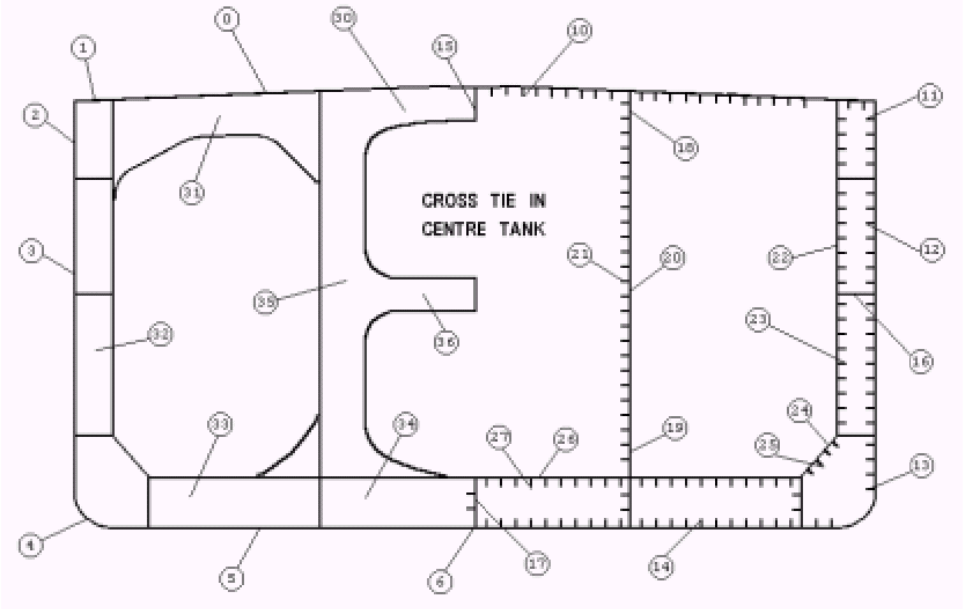
10. Deck longitudinals	20. Longitudinal bulkhead plating (remainder)
11. Sheerstrake longitudinals	21. Longitudinal bulkhead longitudinals
12. Side shell longitudinals	22. Inner side plating
13. Bilge longitudinals	23. Inner side longitudinals
14. Bottom longitudinals	24. Hopper plating
15. Deck girders	25. Hopper longitudinals
16. Horizontal girders in wing ballast tanks	26. Inner bottom plating
17. Bottom girders	27. Inner bottom longitudinals
18. Longitudinal bulkhead top strake	28. Topside tank plating
19. Longitudinal bulkhead bottom strake	29. Topside tank longitudinals

30. Deck transverse — centre tank
31. Deck transverse —wing tank
32. Vertical web in wing ballast tank
33. Double bottom floor — wing tank
34. Double bottom floor — centre tank
35. Longitudinal bulkhead vertical web
36. Cross ties

Sheet 2

Thickness measurement – double hull oil tankers

Typical transverse section on of a double hull tanker above 150 000 dwt
with indication of longitudinal and transverse members



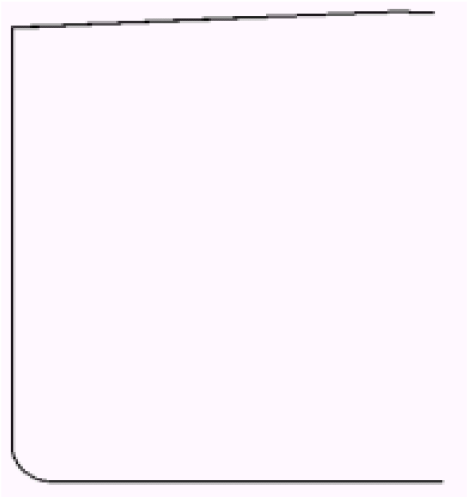
Report on TM2-DHT (i) & (ii)		
0. Strength deck plating	10. Deck longitudinals	20. Longitudinal bulkhead plating (remainder)
1. Stringer plate	11. Sheerstrake longitudinals	21. Longitudinal bulkhead longitudinals
2. Sheerstrake	12. Side shell longitudinals	22. Inner side plating
3. Side shell plating	13. Bilge longitudinals	23. Inner side longitudinals
4. Bilge plating	14. Bottom longitudinals	24. Hopper plating
5. Bottom shell plating	15. Deck girders	25. Hopper longitudinals
6. Keel plate	16. Horizontal girders in wing ballast tanks	26. Inner bottom plating
	17. Bottom girders	27. Inner bottom longitudinals
	18. Longitudinal bulkhead top strake	28. Topside tank plating
	19. Longitudinal bulkhead bottom strake	29. Topside tank longitudinals

		30. Deck transverse — centre tank
		31. Deck transverse —wing tank
		32. Vertical web in wing ballast tank
		33. Double bottom floor — wing tank
		34. Double bottom floor — centre tank
		35. Longitudinal bulkhead vertical web
		36. Cross ties

Sheet 3

Thickness measurement – double hull oil tankers

Transverse section outline. The diagram may be used for those ships where the diagrams on sheet 1 and sheet 2 are not suitable.



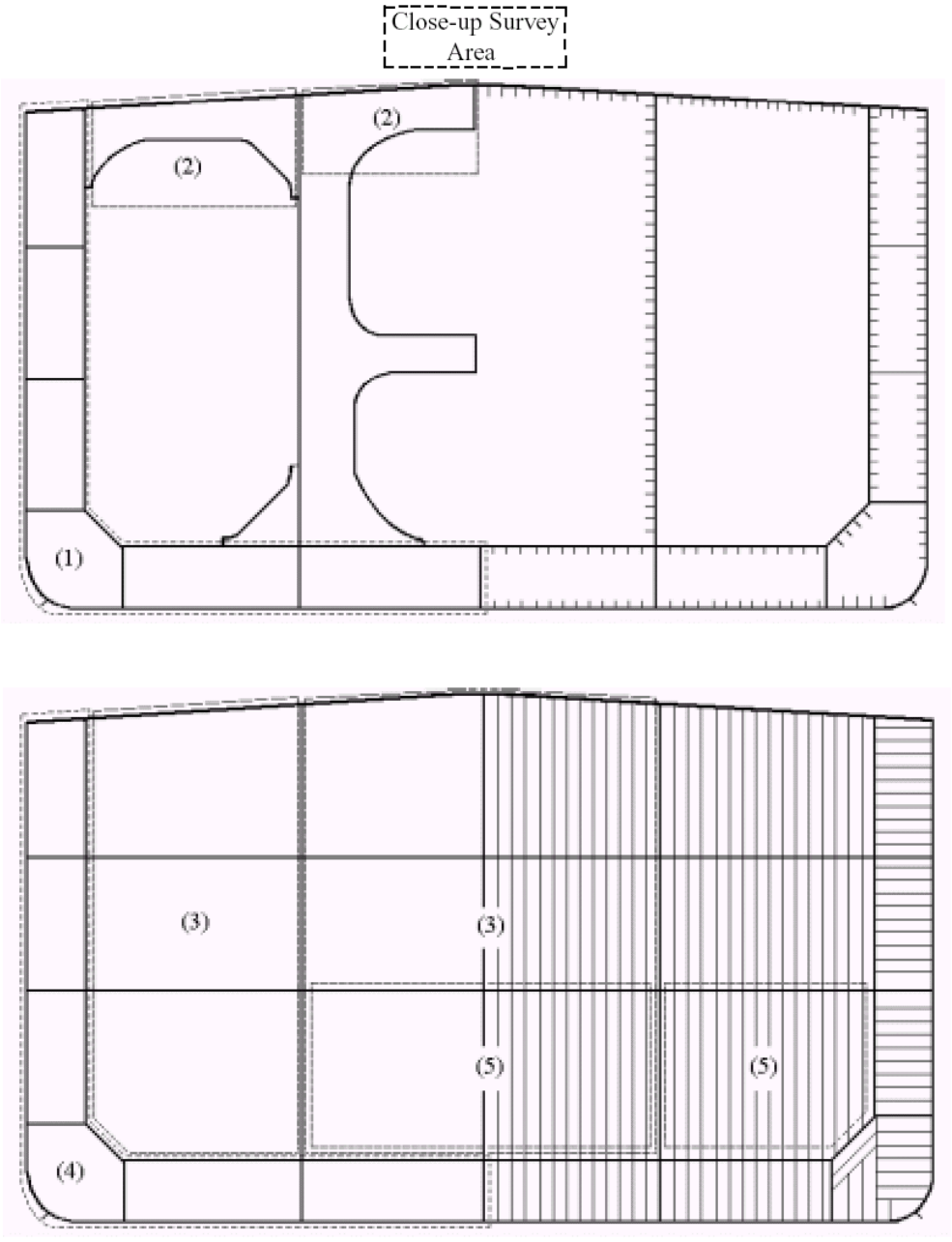
Report on TM2-DHT (i) & (ii)		
0. Strength deck plating	10. Deck longitudinals	20. Longitudinal bulkhead plating (remainder)
1. Stringer plate	11. Sheerstrake longitudinals	21. Longitudinal bulkhead longitudinals
2. Sheerstrake	12. Side shell longitudinals	22. Inner side plating
3. Side shell plating	13. Bilge longitudinals	23. Inner side longitudinals
4. Bilge plating	14. Bottom longitudinals	24. Hopper plating
5. Bottom shell plating	15. Deck girders	25. Hopper longitudinals
6. Keel plate	16. Horizontal girders in wing ballast tanks	26. Inner bottom plating
	17. Bottom girders	27. Inner bottom longitudinals
	18. Longitudinal bulkhead top strake	28. Topside tank plating
	19. Longitudinal bulkhead bottom strake	29. Topside tank longitudinals

	30. Deck transverse — centre tank
	31. Deck transverse —wing tank
	32. Vertical web in wing ballast tank
	33. Double bottom floor — wing tank
	34. Double bottom floor — centre tank
	35. Longitudinal bulkhead vertical web
	36. Cross ties

Sheet 4

Thickness measurement – double hull oil tankers

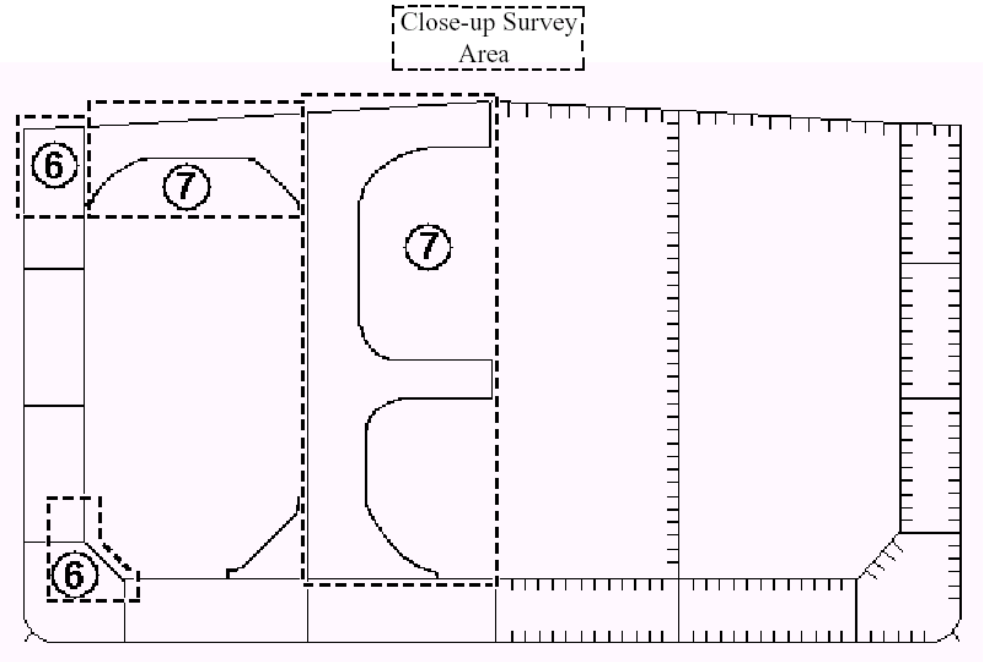
Areas subject to close-up survey and thickness measurements – areas (1) to (5) as defined in Table I of this Publication – thickness to be reported on TM3-DHT, TM4-DHT and TM5-DHT as appropriate.



Sheet 5

Thickness measurements – double hull oil tankers

Areas subject to close-up survey and thickness measurements – areas (6) to (7) as defined in Table I of this Publication – thickness to be reported on TM3-DHT and TM4-DHT as appropriate.



Annex II (CSR)

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF DOUBLE HULL OIL TANKERS BUILT UNDER CSR

1. This, not mandatory document shall be used for recording the thickness measurements of double hull oil tankers built under CSR as required by Table II of this Publication.
2. Reporting forms TM1-DHT(CSR), TM2-DHT(CSR) (I) and (II), TM3-DHT(CSR), TM4-DHT(CSR), TM5-DHT(CSR) and TM6-DHT(CSR) shall be used for recording thickness measurements. The as-built thickness and the voluntary thickness addition and renewal thickness (minimum allowable thickness) shall be stated in an attached document.
3. The remaining pages are guidance diagrams and notes relating to the reporting forms and the procedure for thickness measurement.

CONTENTS:

GENERAL PARTICULARS

Ship's name:

IMO number:

PRS' reg. No.:

Port of registry:

Gross tonnage:

Deadweight:

Date of build:

Classification society:

Name of firm performing thickness measurement:

Thickness measurement firm certified by:

Certificate No:

Certificate valid from ..... to .....

Place of measurement:

First date of measurement:

Last date of measurement:

Class Renewal Survey/Intermediate Survey* due:

Details of measurement equipment:

Qualification of operator:

Report number: consisting of sheets

Name of operator: ..... Name of Surveyor: .....

Signature of operator: ..... Signature of Surveyor: .....

Firm official stamp: PRS official stamp:

Notes:

* Delete as appropriate.

TM1-DHT(CSR) **Report on THICKNESS MEASUREMENT of ALL DECK PLATING, ALL BOTTOM PLATING or SIDE SHELL PLATING***

(* – delete as appropriate)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRAKE POSITION																			
PLATE POSITION	No. or letter	As built Thk.	Volunt. Thik. Addit.	Ren. Thick.	Forward reading						Aft reading						Mean Remaining Corr. Addition, mm [(c1) + (c2)]/2	
					Gauged Thk., mm (b1)		Remaining Corr. Addition, mm (c1) = (b1) – (a)				Gauged Thk., mm (b2)		Remaining Corr. Addition, mm (c2) = (b2) – (a)					
		mm	mm	mm	P	S	P		S		P	S	P		S		P	S
12th forward																		
11th																		
10th																		
9th																		
8th																		
7th																		
6th																		
5th																		
4th																		
3rd																		
2nd																		
1st																		
Amidships																		
1st aft																		
2nd																		
3rd																		
4th																		
5th																		
6th																		
7th																		
8th																		
9th																		
10th																		
11th																		
12th																		

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM1-DHT(CSR)

1. This report shall be used for recording the thickness measurement of:

   A – All strength deck plating within the cargo length area.

   B – Keel, bottom shell plating and bilge plating within the cargo length area.

   C – Side shell plating including selected wind and water strakes outside the cargo length area.

   D – All wind and water strakes within the cargo length area.

2. The strake position shall be clearly indicated as follows:

   2.1 For strength deck, indicate the number of the strake of plating inboard from the stringer plate.

   2.2 For bottom plating, indicate the number of the strake of plating outboard from the keel plate.

   2.3 For side shell plating, give number of the strake of plating sheerstrake and letter as shown on shell expansion.

3. Measurements shall be taken at the forward and aft areas of all plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank shall be recorded.

4. The single measurements recorded shall represent the average of multiple measurements.

5. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM2-DHT(CSR) (I)

Report on THICKNESS MEASUREMENT of SHELL AND DECK PLATING (one, two or three transverse sections)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRENGTH DECK AND SHEERSTRAKE PLATING

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER										SECOND TRANSVERSE SECTION AT FRAME NUMBER										THIRD TRANSVERSE SECTION AT FRAME NUMBER									
	No. or letter	As Built Thk.	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk., mm (b)		Remaining Corr. Addition, mm (b) – (a)				No. or letter	As Built Thk.	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk., mm (b)		Remaining Corr. Addition, mm (b) – (a)				No. or letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk., mm (b)		Remaining Corr. Addition, mm (b) – (a)			
					P	S	P		S						P	S	P		S						P	S	P		S	
Stringer plate																														
1st strake inboard																														
2nd																														
3rd																														
4th																														
5th																														
6th																														
7th																														
8th																														
9th																														
10th																														
11th																														
12th																														
13th																														
14th																														
centre strike																														
sheer strike																														
TOPSIDE TOTAL																														

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM2-DHT(CSR)(I)

1. This report shall be used for recording the thickness measurement of strength deck plating and sheerstrake plating transverse sections:

   One, two or three sections within the cargo length area, comprising the structural items (0), (1) and (2) as shown on the diagram of typical transverse section.

2. The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).

3. The exact frame station of measurement shall be stated.

4. The single measurements recorded shall represent the average of multiple measurements.

5. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM2-DHT(CSR) (II) **Report on THICKNESS MEASUREMENT of SHELL PLATING (one, two or three transverse sections)**

Ship's name ..... PRS' reg. No. ..... Report No. .....

SHELL PLATING																																
STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER										SECOND TRANSVERSE SECTION AT FRAME NUMBER										THIRD TRANSVERSE SECTION AT FRAME NUMBER									
	No. or letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk, mm (b)		Remaining Corr. Addition, mm (b) – (a)				No. or letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk, mm (b)		Remaining Corr. Addition, mm (b) – (a)				No. or letter	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk, mm (b)		Remaining Corr. Addition, mm (b) – (a)			
					P	S	P		S						P	S	P		S						S	P	P		S	
1 st below sheer strake																																
2nd																																
3rd																																
4th																																
5th																																
6th																																
7th																																
8th																																
9th																																
10th																																
11th																																
12th																																
13th																																
14th																																
15th																																
16th																																
17th																																
18th																																
19th																																
20th																																
keel strake																																
BOTTOM TOTAL																																

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM2-DHT(CSR)(II)

1. This report shall be used for recording the thickness measurement of shell plating transverse sections:

   Two or three sections within the cargo length area comprising the structural items (3), (4), (5) and (6) as shown on the diagram of typical transverse section.

2. The bottom area comprises keel, bottom and bilge plating.

3. The exact frame station of measurement shall be stated.

4. The single measurements recorded shall represent the average of multiple measurements.

5. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM3-DHT (CSR)

Report on THICKNESS MEASUREMENT of LONGITUDINAL MEMBERS (one, two or three transverse sections)

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRUCTURAL MEMBERS	FIRST TRANSVERSE SECTION AT FRAME NUMBER										SECOND TRANSVERSE SECTION AT FRAME NUMBER										THIRD TRANSVERSE SECTION AT FRAME NUMBER									
	Item No.	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk, mm (b)		Remaining Corr. Addition, mm (b) – (a)				Item No.	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk., mm (b)		Remaining Corr. Addition, mm (b) – (a)				Item No.	As Built Thk. mm	Vol. Thk. Add. mm	Ren. Thk. mm (a)	Gauged Thk, mm (b)		Remaining Corr. Addition, mm (b) – (a)			
					P	S	P		S						P	S	P		S						P	S	P		S	

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM3-DHT(CSR)

1. This report shall be used for recording the thickness measurement of longitudinal members at transverse sections:

   Two or three sections within the cargo length area, comprising the structural items (10) to (29) as shown on the diagram of typical transverse section.

2. The exact frame station of measurement shall be stated.

3. The single measurements recorded shall represent the average of multiple measurements.

4. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM4-DHT(CSR)

Report on THICKNESS MEASUREMENT of TRANSVERSE STRUCTURAL MEMBERS in the cargo oil and water ballast tanks within the cargo tank length

Ship's name ..... PRS' reg. No. ..... Report No. .....

TANK DESCRIPTION:										
LOCATION OF STRUCTURE:										
STRUCTURAL MEMBER	ITEM	As Built Thickness mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Gauged Thickness, mm (b)		Remaining Corr. Addition, mm (b) – (a)			
					P	S	P		S	

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM4-DHT(CSR)

1. This report form shall be used for recording the thickness measurement of transverse structural members, comprising the appropriate structural items (30) to (36) as shown on diagram of typical transverse section, page 77 to 78 of this Publication.
2. Guidance for areas of measurement is indicated on the diagrams shown on pages 77 and 78 of this Publication.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM5-DHT(CSR)

Report on THICKNESS MEASUREMENT of W.T./O.T. TRANSVERSE BULKHEADS

Ship's name ..... PRS' reg. No. ..... Report No. .....

HOLD DESCRIPTION:									
LOCATION OF STRUCTURE:				FRAME NO.:					
STRUCTURAL COMPONENT (PLATING/STIFFENER)	As Built Thickness mm	Voluntary Thickness Addition mm	Renewal Thickness mm (a)	Gauged Thickness, mm (b)		Remaining Corr. Addition, mm (b) – (a)			
				P	S	P		S	

Operator's signature .....

NOTES – see next page

NOTES

to the report sheet TM5-DHT(CSR)

1. This report form shall be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
2. Guidance for areas of measurement is indicated on the diagrams shown on pages 77 and 78 of this document.
3. The single measurements recorded shall represent the average of multiple measurements.
4. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

TM6-DHT (CSR)

Report on THICKNESS MEASUREMENT of MISCELLANEOUS STRUCTURAL MEMBERS

Ship's name ..... PRS' reg. No. ..... Report No. .....

STRUCTURAL MEMBER:										SKETCH
LOCATION OF STRUCTURE:										
Description	As Built Thk. mm	Voluntary Thickness Addition mm	Renewal Thk. mm (a)	Gauged Thickness, mm (b)		Remaining Corr. Addition, mm (b) – (a)				
				P	S	P		S		

Operator's signature .....

NOTES – see next page

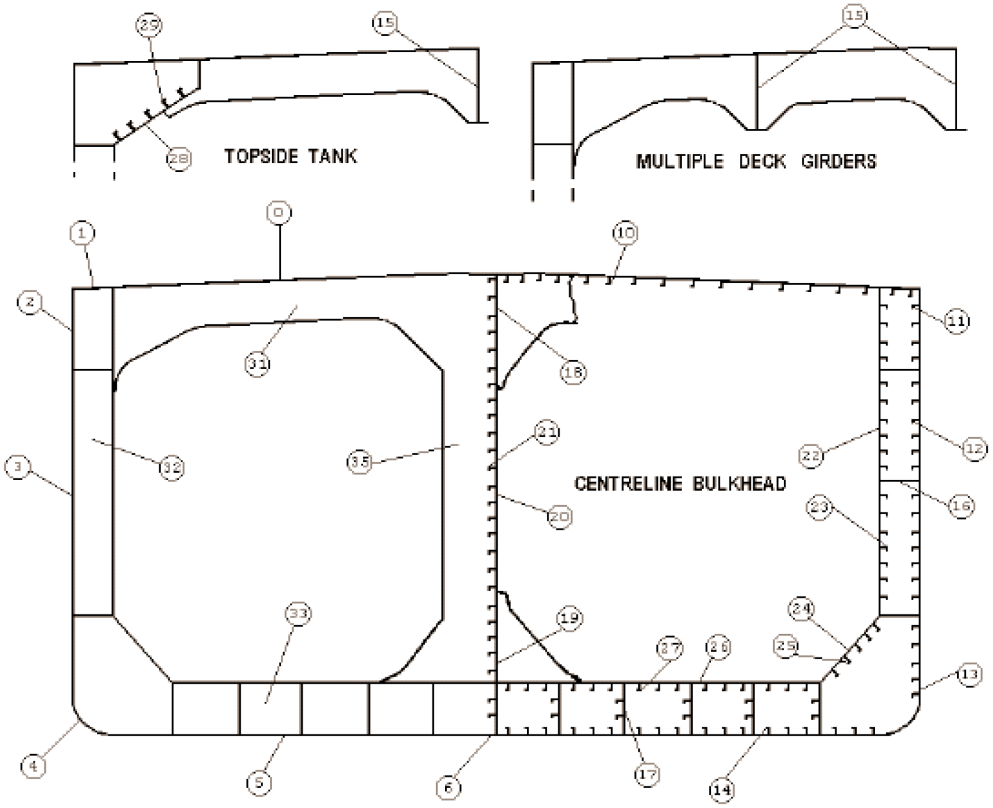
NOTES

to the report sheet TM6-DHT(CSR)

1. This report shall be used for recording the thickness measurement of miscellaneous structural members
2. The single measurements recorded shall represent the average of multiple measurements.
3. The remaining corrosion addition shall be recorded with result of gauged thickness minus renewal thickness. If the result is negative, the structure in way shall be renewed, and the mark “R” shall be indicated in the right-hand column. If the result is between 0 and 0.5 mm (0 included), the structure in way shall be additional gauged, and the mark “S” shall be indicated in the right-hand column.

Thickness measurement – Double Hull Oil Tanker

Typical transverse section of a double hull oil tanker up to 150,000 dwt
with identification of longitudinal and transverse members



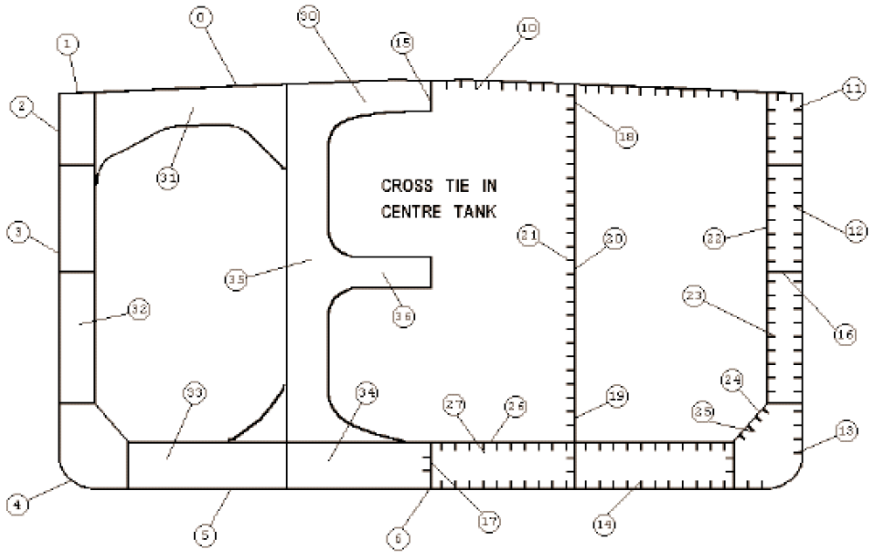
Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

Report on TM3-DHT(CSR)			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinal
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinal
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Thickness measurement – Double Hull Oil Tankers

Typical transverse section of a double hull oil tanker above 150,000 dwt with indication of longitudinal and transverse members



Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

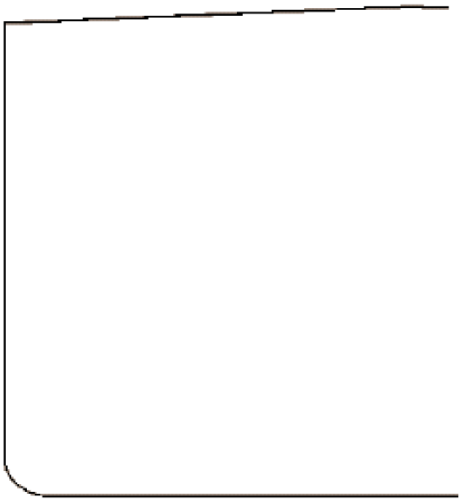
Report on TM3-DHT(CSR)			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinal
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinal
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Thickness measurement – Double Hull Oil Tankers

Transverse section outline.

To be used for those ships where the diagrams on pages 77 and 78 are not suitable.



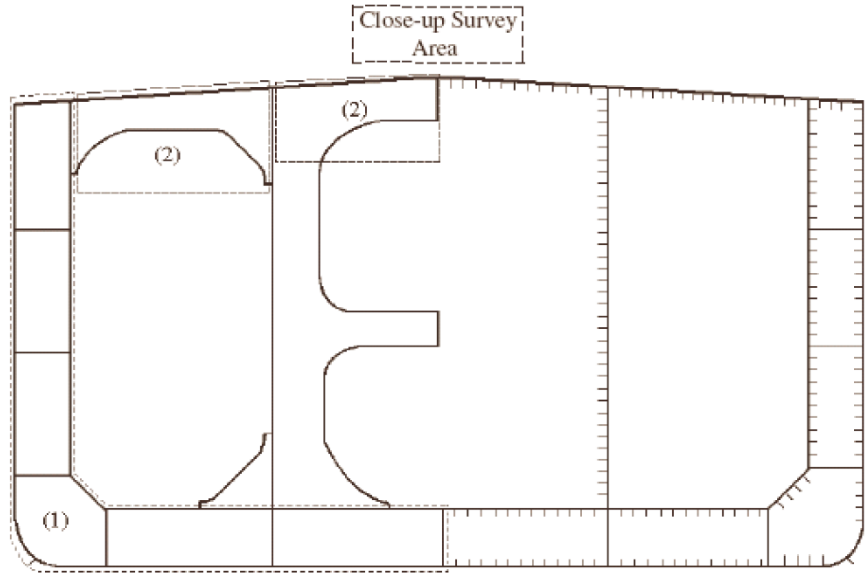
Report on TM2-DHT(CSR) (i) & (ii)	
0.	Strength deck plating
1.	Stringer plate
2.	Sheerstrake
3.	Side shell plating
4.	Bilge plating
5.	Bottom shell plating
6.	Keel plate

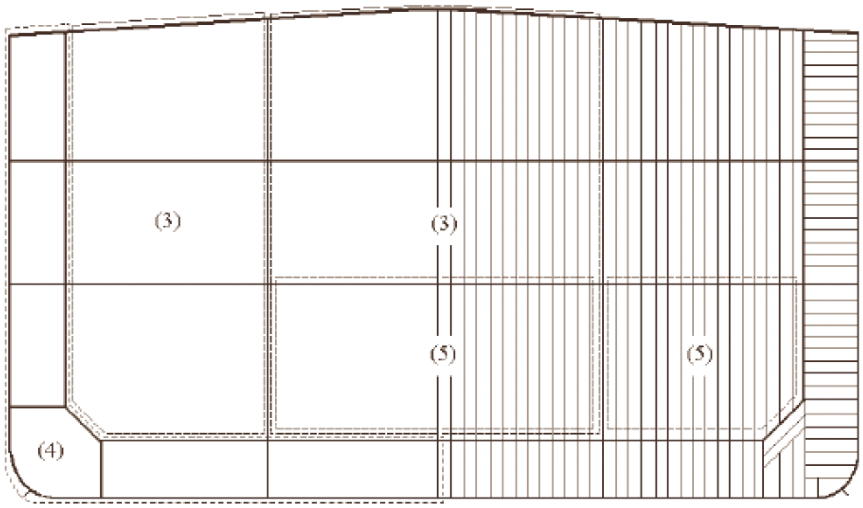
Report on TM3-DHT(CSR)			
10.	Deck longitudinals	20.	Longitudinal bulkhead plating (remainder)
11.	Sheerstrake longitudinals	21.	Longitudinal bulkhead longitudinals
12.	Side shell longitudinals	22.	Inner side plating
13.	Bilge longitudinals	23.	Inner side longitudinal
14.	Bottom longitudinals	24.	Hopper plating
15.	Deck girders	25.	Hopper longitudinal
16.	Horizontal girders in wing ballast tanks	26.	Inner bottom plating
17.	Bottom girders	27.	Inner bottom longitudinals
18.	Longitudinal bulkhead top strake	28.	Topside tank plating
19.	Longitudinal bulkhead bottom strake	29.	Topside tank longitudinals

Report on TM4-DHT(CSR)	
30.	Deck transverse - centre tank
31.	Deck transverse - wing tank
32.	Vertical web in wing ballast tank
33.	Double bottom floor - wing tank
34.	Double bottom floor - centre tank
35.	Longitudinal bulkhead vertical web
36.	Cross ties

Close-up Survey and Thickness Measurement Areas

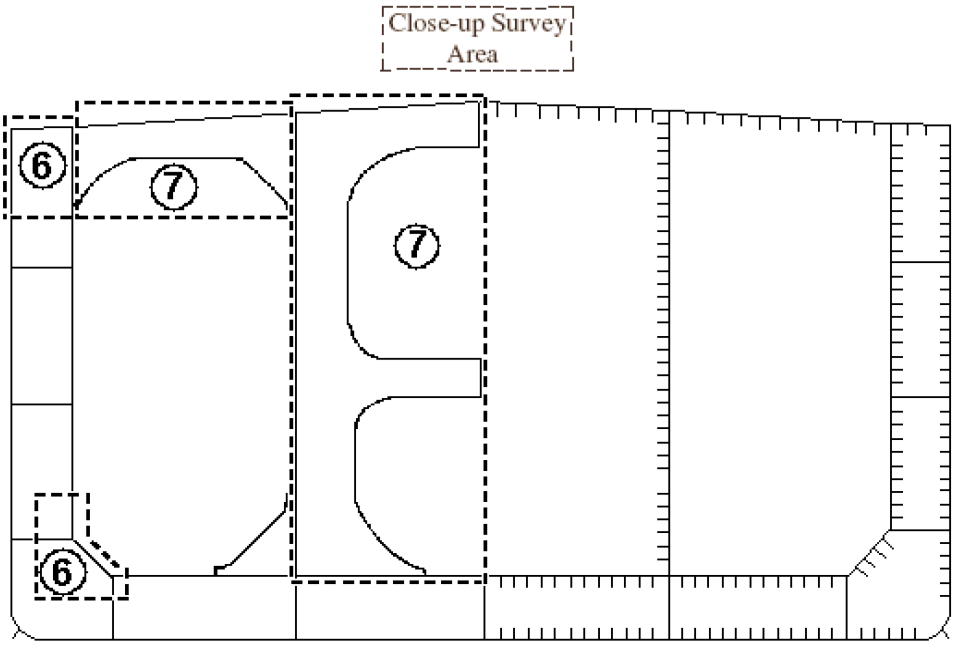
Areas subject to close-up survey and thickness measurements – areas (1) and (5) as defined in Table I of this Publication. Thickness to be reported on TM3-DHT(CSR), TM4-DHT(CSR) and TM5-DHT(CSR), as appropriate.





Close-up Survey and Thickness Measurement Areas

Areas subject to close-up survey and thickness measurements – areas (6) and (7) as defined in Table I of this Publication. Thickness to be reported on TM3-DHT(CSR) and TM4-DHT(CSR), as appropriate.



Annex III

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS

1 General

1.1 These criteria shall be used for the evaluation of longitudinal strength of the ship's hull girder as required by 8.1.1.1 description in this Publication.

1.2 In order that ship's longitudinal strength to be evaluated can be recognized as valid, fillet welding between longitudinal internal members and hull envelopes shall be in sound condition so as to keep integrity of longitudinal internal members with hull envelopes.

2 Evaluation of Longitudinal Strength

On oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder shall be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the Class Renewal Survey. The condition of the hull girder for longitudinal strength evaluation should be determined in accordance with the methods specified in Appendix 3.

2.1 Calculation of Transverse Sectional Areas of Deck and Bottom Flanges of Hull Girder

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder shall be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the Class Renewal Survey.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10 % of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures shall be taken:

.1 to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or

.2 to calculate the actual section module (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in Appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the Class Renewal Survey.

2.2 Requirements for Transverse Section Modulus of Hull Girder

2.2.1 The actual section modulus of transverse section of the ship's hull girder calculated in accordance with the foregoing paragraph 2.1.2.2 shall satisfy either of the following provisions, as applicable:

.1 for ships constructed on or after 1 July 2002, the section moduli of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 should not to be less than 90% of the section moduli for new ship as specified in *Part II – Hull* of the *Rules for the Classification and Construction of Sea-going Ships*; or

.2 for ships constructed before 1 July 2002, the section moduli of the transverse section of the ship's hull girder calculated in accordance with the requirements of the foregoing paragraph 2.1.2.2 shall fulfil the criteria required by PRS, provided that in no case it shall be less than the diminution limit of the minimum section modulus as specified in Appendix 2.

APPENDIX 1

CALCULATION CRITERIA OF SECTION MODULI OF MIDSHIP SECTION OF HULL GIRDER

Calculation criteria of section moduli of midship section of hull girder, are specified in the *Rules for the Classification and Construction of Sea-going Ships*, *Part II – Hull*, para 15.7.

APPENDIX 2

DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE

1 The diminution limit of the minimum section modulus (W_o) of oil tankers in service is given by the following formula:

$$W_o = cL^2 B(\delta + 0.7)k \quad (\text{cm}^3)$$

where:

L = length of ships. L is the distance, in meters, on the summer load waterline from the fore side of stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post. L shall not be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement the length L may be specially considered;

B = greatest moulded breadth in metres, measured between outer edges of frames

δ = moulded block coefficient at draught T corresponding to summer load waterline. δ shall not be taken less than 0.60.

$$\delta = \frac{\text{moulded displacement } (\text{m}^3) \text{ at draught } T}{L\,B\,T}$$

T – moulded draught, [m], the vertical distance measured amidships from the base plane to the summer load waterline;

$$c = 0.9c_w$$

$$c_w = 10.75 - \left(\frac{300 - L}{100}\right)^{1.5} \quad \text{for } 130 \text{ m} \le L \le 300 \text{ m}$$

$c_w = 10.75$ for $300 \text{ m} < L < 350 \text{ m}$

$$c_w = 10.75 - \left(\frac{L - 350}{150}\right)^{1.5} \quad \text{for } 350 \text{ m} \le L \le 500 \text{ m}$$

k – material factor, e.g.

k = 1.0 for mild steel with yield stress of 235N/mm² and over;
k = 0.78 for high tensile steel with yield stress of 315N/mm² and over,
k = 0.72 for high tensile steel with yield stress of 355N/mm² and over.

2 Scantlings of all continuous longitudinal members of the ship's hull girder based on the section modulus requirement in (1) above shall be maintained within 0.4L amidships. However, in special cases, based on consideration of type of ship, hull form and loading conditions, the scantlings may be gradually reduced towards the end of 0.4L part, bearing in mind the desire not to inhibit the ship's loading flexibility.

3 However, the above standard may not be applicable to ships of unusual type or design, e.g. for ships of unusual main proportions and/or weight distributions.

APPENDIX 3

SAMPLING METHOD OF THICKNESS MEASUREMENTS FOR LONGITUDINAL STRENGTH EVALUATION AND REPAIR METHODS

1 Extent of longitudinal strength evaluation

Longitudinal strength should be evaluated within 0.4*l* amidships for the extent of the hull girder length that contains tanks therein and within 0.5*l* amidships for adjacent tanks which may extend beyond 0.4*l* amidships, where tanks mean ballast tanks and cargo tanks.

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.4 of this Publication, transverse sections should be chosen such, that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with sea water and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with sea water should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with Table II. The transverse sections should be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and should be clear of areas which have been locally renewed or reinforced.

2.3 At least two points should be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of Table II.

2.4 Within 0.1*D* (where *D* is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of Table II, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at least in one point per strake.

2.6 The thickness of each component should be determined by averaging all of the measurements taken in way of the transverse section on each component.

3 Additional measurements where the longitudinal strength is deficient

3.1 Where one or more of the transverse sections are found to be deficient in respect of the longitudinal strength requirements given in this annex, the number of transverse sections for thickness measurement should be increased such that each tank within the 0.5*l* amidships region has been sampled. Tank spaces that are partially within, but extend beyond, the 0.5*l* region, should be sampled.

3.2 Additional thickness measurements should also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of this Publication.

4 Effective repair methods

4.1 The extent of renewal or reinforcement performed to comply with this Appendix should be in accordance with 4.2.

4.2 The minimum continuous length of a renewed or reinforced structural member should be not less than twice the spacing of the primary members in way. In addition, the thickness diminution in way of he butt joint of each joining member forward and aft of the replaced member (plates, stiffeners, girder webs and flanges, etc.) should not be within the substantial corrosion range (75% of the allowable diminution associated with each particular member). Where differences in thickness at the butt joint exceed 15% of the lower thickness, a transition taper should be provided.

4.3 Alternative repair methods involving the fitting of straps or structural member modification should be subject to special consideration. In considering the fitting of straps, it should be limited to the following conditions:
- to restore and/or increase longitudinal strength;
- the thickness diminution of the deck or bottom plating to be reinforced should not be within the substantial corrosion range (75% of the allowable diminution associated with the deck plating);
- the alignment and arrangement, including the termination of the straps, is in accordance with a standard recognized by PRS;
- the straps are continuous over the entire 0.5*L* amidships length; and
- continuous fillet welding and full penetration welds are used at butt welding and, depending on the width of the strap, slot welds. The welding procedures applied should be acceptable to PRS.

4.4 The existing structure adjacent to replacement areas and in conjunction with the fitted straps, etc. should be capable of withstanding the applied loads, taking into account the buckling resistance and the condition of welds between the longitudinal members and hull envelope plating.

Annex IVA

HULL SURVEY PROGRAMME

1. *Hull Survey Programme* (Form 328PR) covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo length area, cargo holds, ballast tanks, including fore and after peak tanks, required by this Publication.
2. *Hull Survey Programme* shall be evaluated by the Owner in co-operation with PRS.

Annex IVB

SURVEY PLANNING QUESTIONNAIRE

Survey Planning Questionnaire (Form 628) is dedicated to complete necessary information which enables the Owner, with PRS cooperation, to develop *Hull Survey Programme* required by this Publication. The Questionnaire, reflecting current information, should be worked out by the Owner. Completed Questionnaire should be delivered to PRS.

Annex IVC

OWNER'S INSPECTION REPORT
Structural condition

Ship's name .....

For tank No. .....

Grade of steel: Deck: ..... Side: .....

Bottom: ..... Long. bhd.: .....

Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modification Repairs	Other
Deck							
Bottom							
Side							
Longitudinal bulkheads							
Transverse bulkheads							

Repairs performed due to:

Thickness measurements performed, dates:

Results in general:

Overdue surveys:

Outstanding conditions of class:

Comments:

Date of inspection:

Inspected by:

Signature:

List of amendments effective as of 1 July 2024

Item	*Title/Subject*	*Source*
1.2	Definitions: ballast tank	IACS UR Z10.4 Rev.18~~17~~
Enclosures Table II	Thickness measurements; Class Renewal Survey No.1	
4.5.1		
5.6.6		
